MODEL AIRPLANE NEWS

JUNE 1953—25 CENTS

GRUMMAN COUGAR

MODEL AIRPLANE NEWS

Serving Aviation 23 Years

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CONTENTS

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M. A. N. AT WORK

by William Winter

▶ On March 13, at the Governor Clinton Hotel in New York, took place a most interesting and, we think, significant development. During the preceding week, the annual Toy Fair had been in session. The Toy Fair comprises about a dozen floors in each of several large hotels and, among the many hundreds of manufacturers who display wares for the toy buyers of the nation, are a dozen or more of our own model airplane kit, engine and accessory producers.

* * *

▶ Taking advantage of this convenient opportunity to talk shop, Monogram's Jack Besser took the bull by the horns, called a meeting of model airplane displayers and editors and, in a corking address, called a spade a spade, saying that the model airplane section of the Model Industries Association should speak up and, within the framework of MIA, do something about an eight-point program to further model activities. Now MAN has been sitting in on such meetings, both AMA and MIA, and all too frequently, are unproductive. Not this one.

* * *

▶ Five of Besser's points dealt directly with us modelers. First, he wanted to know about the relation of the annual International Competition (Wakefield and FAI Gas) to the model aeronautics group of MIA — in other words what could this group do to promote international competition? How could the group assist the Academy of Model Aeronautics, was the second point. And here it was interesting to note that some MIA people had long been interested in this subject but the modelers themselves had never been articulate about what was needed. Apparently, we should be more definite and not leave objectives up in the air. Additional topics included the need for a tie-in with local Plymouth Model Contests—too many local model dealers fumble the ball; tie-in with the Plymouth International Meet itself, and with the Nationals. MAN at Work can report that these people listened with rapt attention, then set up a number of high-powered committees.

* * *

▶ Bob Reder outlined the work that had been done by the Wakefield Committee (the modelers' own committee), showed how they had raised their own funds to transport a team to Europe, and, by the time he wound up, the MIA group knew more about the subject than the average modeler. After hearing a bewildering amount of enthusiastic but always incisive discussion, told the group that we had never expected to see the day when the manufacturers as a group would so take to heart the affairs of the more advanced, contest going modeler. That, if they wanted to know what they could do for us, the biggest thing would be to show interest in our activities as they were doing that night. That the international events, the Nationals, were most worthy fields for their assistance. Seems to us that the modelers, through AMA, should strike while the iron is hot. What can be done has been brilliantly demonstrated by the Wake- *(Continued on page 5)*

PLANE ON THE COVER—GRUMMAN COUGAR

This month's cover is the Grumman Cougar jet fighter now being built in quantity for the United States Navy as a carrier-based fighter. Pictured by artist Jo Kotula in a whistling dive, the Cougar greatly resembles the older "straight wing" Panther which it renders obsolete. Next month, another in the series of historical aircraft will be featured on the cover, the Boeing P-26, one of the all-time great fighters, rated first in letters from MAN readers.


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Man at Work . . . .

(Continued from page 2)

field modeler's whose small committee has put life into the whole picture, gas or rubber.

* * *

▸ The British are perturbed by our comments that (speaking of Wakefield rules) the British have made another change in the rules. "This definitely was not the case," C. S. Rushbrooke, editor of the Aeromodeller tells us. "The true situation was that at the FAI conference in Paris last December," explained Rushy, "the Belgian delegate proposed a limitation of rubber weight for the World Championship (Wakefield Class). The voting in favor of this limitation was seven in favor, two against, and one abstentation, and it is proposed that this change in formula will be introduced in 1954.

"This proposition came as much as a surprise to us as anybody else," he continued, "for it is an unfortunate fact that no agendas are issued for FAI meetings . . . however, I learn, that the proposals made at the December meeting are due for ratification at the next conference to be held at the Hague in May, and it will be interesting to learn whether the reactions that follow on this proposal will be strong enough to either carry through or cancel it."

* * *

▸ To say that the Wakefield situation is incredibly confused is to put it mildly. Frankly, MAN at Work is still confused. FAI lack of publicity is tantamount to secrecy. For 20 years had been under the impression that the British, who set up this event, made the rules and instituted changes only in those years when the event was held in England. Who does make the rules? Most of the Wakefielders we have heard from are indignant about the new rules proposed for 1954. Some threaten to give up—but they won't, because a Wakefield man never gives up on anything. American resistance, apparently as well as British, is taking the form of heading off the "horrible fate" of proposed rules. MAN doesn't agree that the "changes should be changed." If the FAI has the right to make these rules, and has done so by a democratic process, it is up to the U.S. and the British, to abide by those rules. Not to do so is unsporting. There is something distasteful about objecting to rules made by the authorized rules making body, made up of representatives of interested nations. If we are not represented, that's too bad. Here's a spot for the MIA group to help. We should have proper representation at future FAI conferences. International competition requires more than sending a team. America is not isolationist, though its modeling still seems to be.

* * *

▸ The question of the '54 rules goes beyond this. Personally, we are not agast at the Belgian modelers suggestions to limit rubber weight. As we told Rushbrooke, MAN at Work hasn't been tempted to make a Wakefield since those long fuselage monstrosities became the fashion. Die-hard Wakefielders who revere the flying cue sticks forget that, as happened in indoor modeling, the proponents of the event have priced themselves out of the market. Yes, Wakefield is the acme of all modeling but how far can we go before the event goes so super scientific that no one will have a part of it. Models are fragile to an impossible degree and a man has to have a born instinct to handle the tremendous rubber motors (in the neighborhood of five ounces now). There is great emphasis on the technique of handling and flying, on indoor-outdoor construction, on discouraging widespread participation. With rubber weight limited to under three ounces, development would go into construction for strength and streamlining, into basically good and sensible designs that perform on their own merits rather than on a wizard builder's resourcefulness in adjusting and handling. Such a trend may eventually lead to retractable gears, good finishes, variable pitch props in more cases, and to machines that have a relationship to aircraft.

▸ We do feel perturbed, nonetheless by the suddenness of the rules change. Though intriguing and with its good points, sudden, drastic rules changes in AMA past experience have had serious repercussions. Every rules change affects design, usually in unforeseen and frightening ways, and consequently should be gradual, the result of pressures from the modelers themselves over a period of time. The FAI conference would be far from the first rules meeting to go haywire. Anyway, given our choice, MAN at Work likes this particular change. It certainly couldn't be worse than the trends of the past few years. Not from the average modeler's point of view, it couldn't. Let's put tissue on indoor models and let the mob in, too. To the storm cellar!

* * *

▸ Jim Saftig's recent suggestions for holding elimination meets before the Nationals, and for financing them, gained widespread attention. Counter suggestions were many. Don Santee, Salem, Oregon, thinks clubs would buy the idea but that it would be a problem putting it across nationally.

"It might be handled at the state level," thinks Don. "Probably most states have some kind of organization similar to our Oregon Aeromodellers Association. These groups would be ideal for pushing the elimination plan. Member clubs could contribute funds toward sending area representatives to the Nationals."

Claude "Mac" MacCullough who doesn't pull his punches says, "Amen to your comments on International event competition . . . it is high time we quit looking for a financial Santa Claus to wave his pocketbook to send a team across the pond. Modelers should undertake their own financing. Charge an extra 25 cents entry fee at every contest, plainly ear marked International Competition Fund."

"Thus," continues Mac, "the monetary contribution could be gauged according to the extent of contest activity of the flier and the more active they are the more their interests are served by such a fund. While such a small charge would be comparatively painless, the amount of money accruing in a year's time should be a substantial amount. The most active aeromodelling nation in the world should be represented by a full team at every international meet, regardless of cost."

* * *

▸ Contests: May 30-31, Fourth Annual Exchange Club Model Airplane Contest; for ORU, TL, FF, FFSC, PAA, RC—Twin Cities Model Airplane Club, P. O. Box 91, Yuba City, Calif.

Galesburg Model Airplane Club (Illinois), May 30, open event team race. Ken Freese, 224 Silver Street, or Ray's Hobby Shop, 224 East North St.

AAA Plymouth sponsored Free Flight meet, all classes and rc, June 28, Winston-Salem, N. C. Contact E. D. Aldridge, Skywriters Model Airplane Club, 853 Watson Ave.

Model Flying Circus, Evansville, Indiana, July 12, all events control line and rc. Virgil W. Kays, 15 Main St.

Second Annual Model Aircraft Meet, Cumberland Field, Nashville, Tenn., June 13-14, Class AAA, for all FF, TG, OHLG, OR. RC, FSFF, perhaps Wakefield eliminations. Speed, combat, jet, team racing, scale. Carl Miller, 427 Deaderick St.

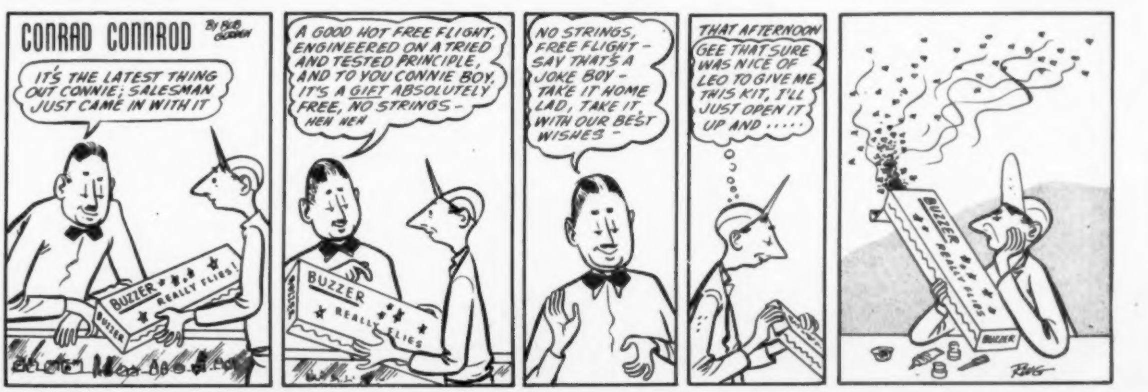
Annual Contest, Medford Prop Nuts (Oregon), Spt. 6, AA for FF, ORU, TL. RC. Contact, T. W. Mast, 828 West 2nd St.

Clarinda, Iowa, May 31, Municipal Airport; contact, C. C. Anderson, Centennial Model Airplane Show.

* * *

▸ In response to demands made by MAN at Work, ole weather man sent along one tremendous, sunny Saturday, a clear but windy Sunday, and a second windy but otherwise passable weekend. So got in about 35 flights, mostly on a *Live Wire Sr.* Harold DeB says this (ours) ship is upsetting his theories. It weighs 6 lbs., 6 ozs. on a K & B 19, and any wind that you don't have to lean against to stand up slows it up just a little. At 508 ounce power loading and 19 wing loading, it goes like mad, even bumps thermals and soars a little on a hot day if trimmed mushy. Had a Rockwood three channel in it at 7-1/4 pounds, but was afraid to fly so took it out. Bad mistake for it would have carried it easily — if launching was tough a two-speed 29 would have settled the problem. On a 10 x 6 it is tough launching but an 11 x 4 does fine . . . speaking of rc, one of the boys made a measured mile ground check on the ECC hard tube receiver and it was still going fine. Fooling with the ED Boomerang gas tuber. Did good ground checks right off using brand new tubes, took every hivac and RK-61 in the house. This has us rubbing our eyes. ED's polarized

(Continued on page 8)



Man at Work

(Continued from page 5)

relay is making a hit, guys substituting them in many receivers.

* * *

▸ See by the CCAMA News (Connecticut Chapter, AMA) that the Greater Hartford Model Airplane Club is running classes in model construction and flying. This worthy program is sponsored by the Plymouth Dealers of Connecticut, and the *Hartford Times*, and is held in the carpenter shop of the Hartford Trade School. Superintendents of schools throughout the area have given hearty approval. Course started March 9, Mondays 7 to 9, for eight weeks.

* * *

▸ Then there's that saying about the man who builds a better mouse trap. Scale model fans—or anyone who wants a touch of realism on a flying job—will go for Matty "Plastic Man" Sullivan's new bubble canopy (Sullivan Products). This bubble is molded, not pressed from sheet, and has a reverse molding to show frame lines. This is the gimmick. It's a cinch to paint in the lines following the molding. Has a center pin at front for easy, accurate mounting. Only a Half A bubble so far, but Matty promises others. Remember when we used to make canopies by painting endless coats of clear dope over a form?

* * *

▸ And here is something for club secretaries looking for a new movie to show at meetings. "From Little Wings" is the title and it demonstrates payload models, relating them to model aviation generally. Picture was made at the last nationals at Los Alamitos, Calif., so you may get to the 1952 Nationals after all. Film is 16mm, color and sound, and runs 13-1/2 minutes. Can be obtained from AMA Headquarters, 1025 Connecticut Ave., Washington, D. C.; National Hobby Distributors, 2512 North Greenview Ave., Chicago, Ill.; and Civil Aeronautics Administration Film Centers (Aviation Education) in Washington, Fort Worth, Seattle, Chicago, Los Angeles. Contest directors who can arrange television showings get in touch with George Gardner, Educational Director, Pan American World Airways, 28-19 Bridge Plaza North, Long Island City 1, N. Y.

* * *

▸ With a rash of new engines appearing in so many interesting displacements, nothing, well almost nothing would surprise us. Artie "Consolidated" Hasselbach did surprise us; he's got a racing 60, the *Hell Razor 60* which, he told us, has turned 24,000 on the bench with a 7-ounce flywheel. During 1952, this engine was tested in boats. Features include two crankshaft ball bearings, one piston ring, twin exhaust ports, twin transfer ports, pins on drive plate for prop. Bore is 1.015 inch, stroke .750. Weight is 9-3/4 ounces.

* * *

▸ Flying Tomohawks, Sheboygan, Wis., changed name from Pirate Model Club, invite anyone to get out and fly with them: fly ukie at Kiwanis Park with blessings of Park Department, free flight at Polor Ware circus grounds; meets Monday eve at Lea's Hobby Center, the club sponsor.

* * *

▸ New collector's item with special interest to the air-minded are vari-sized, assorted packets of official airline baggage stickers. Would look good on shop walls, on model planes or baggage if you want a one-minute trip to Rome or India. Groups that caught our eye were the #2 assortment of 20 different stickers from U.S. and foreign airlines priced at 65c; also, the king size #5 assortment of stickers of 75 U. S. and foreign carriers. (Never knew there were that many airlines.) This group sells for $2.70. These colorful stickers are available now at Global Stickers, International Airport, Jamaica 20, New York. END

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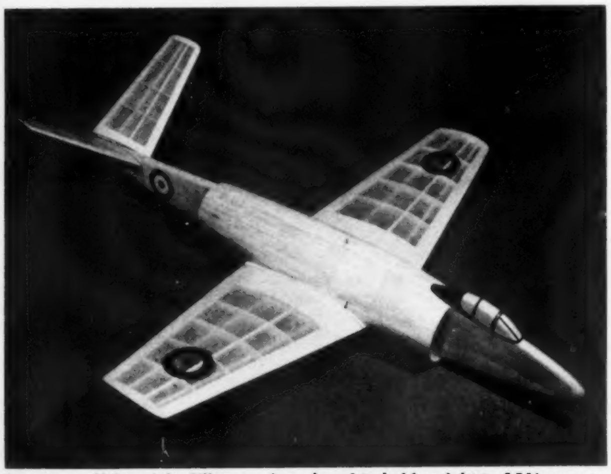
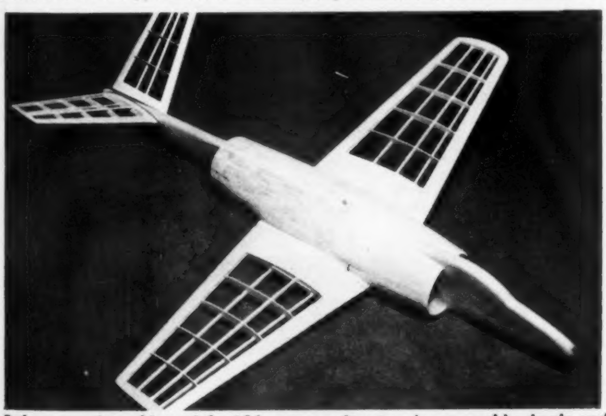
For simplicity, the designer profiled the front and rear of the fuselage. The built-up, balsa-planked, circular mid-section houses the Cub driving the fan.



Covering is lightweight *Silkspan*, clear doped to hold weight to 15½ ounces. Nose ballast is 1¼ ounces. A fast flier, ship would be spectacular on Cub .14.



Before covering, ship weighs 13¾ ounces. Structure is reasonably simple and extremely sturdy. Generous size hatch opens amidships for engine starting.

Left—Four main components detach for easy transportation; wing panels, tail assembly knock off in emergency.

SUPERMARINE 508

By BILL DEAN

Powered by Cub .09, this big ducted fan version of a famous jet fighter flew out of sight on its first flight after two minutes 15 seconds.

▼

After reading through Tom Purcell's account of his ducted-fan experiments (October '51 M.A.N.), it was only a question of time before we too succumbed to the lure of a glo-motor powered jet scale. Finally, we settled for a replica of the unconventional Vickers Supermarine *508*—a big twin-*Avon* powered shipboard fighter. Features of this aircraft which particularly attracted us were simple unswept wings, butterfly tail and, best of all, large intakes and outlets on each side of fuselage.

We built a Jetex 50 version to test out basic layout and, since this performed well, went straight on to draw up plans to suit the *Cub* .099. We abandoned the idea of an exact scale (oval-section) fuselage, as duct construction complications seemed undesirable for a magazine feature. So instead, we made the main fuselage circular and profiled nose and tail.

By using P. E. Norman's half-shell method of planked monocoque construction, we were able to install a much larger fan than would have otherwise been possible. The final result is a fast flying model that differs little in appearance from the full size machine once it becomes airborne. Our own model flew out of sight on its first flight of 2 min. 15 sec. and performance far exceeds our early expectations. We found that the .099 *Cub* supplies ample power for this 15½ ounce model, but there is plenty of room for the larger .14 *Cub*, with which really spectacular results should be obtained.

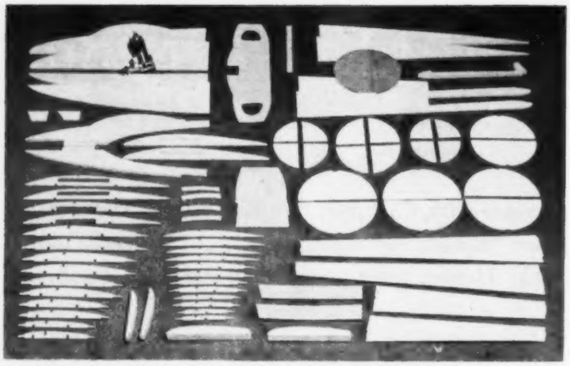
Construction is not difficult, but you'll get along much faster if you follow the same building sequence as detailed in these notes. Start by cutting out all sheet parts, using only medium weight balsa, since an all-up weight of 15-16 ounces must be aimed for. Modify central cut-out in wing tongue to suit the particular powerplant you intend using.

Flying surface structure is both simple and strong, being of a type used with success by the writer on numerous F/F contest models. Start wing panel by pinning 3/16" x 1/8" spars, L.E. and T.E. in place, followed by 1/16" sheet tapered L.E. and T.E. pieces and lower 1/16" sheeting at root ribs. This latter sheeting must be chamfered away at rib two to allow room for wing tongue box. Now cement and pin ribs—one to seven in place, tilting rib one to allow for dihedral (check angle with template X).

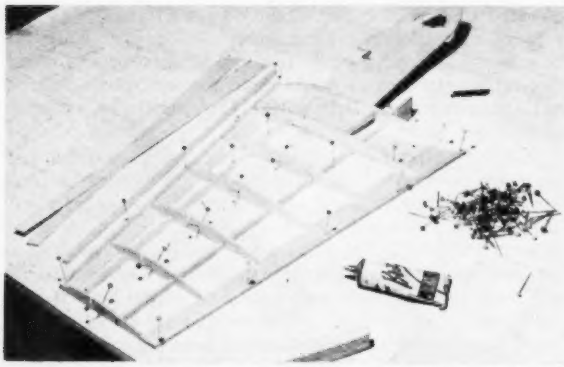
Insert wing tongue box and check for correct alignment with tongue pushed home (rear edge of tongue should make right angle with face of rib one) before cement has time to set. Add upper 3/16" x 1/8" spar and tapered 1/16" sheet L.E. and T.E. pieces. Sheet over space between ribs one and two. Shape tip block in top view and cement to rib seven. When dry, remove panel from plan and carve and sand L.E., T.E. and tip to indicated sections. Repeat process for other wing panel.

Stabilizer construction is similar to that of wing panels, except that strip L.E. and T.E. pieces are omitted. Pin tapered 1/16" sheet L.E. and T.E. pieces (*Continued on page* 50)

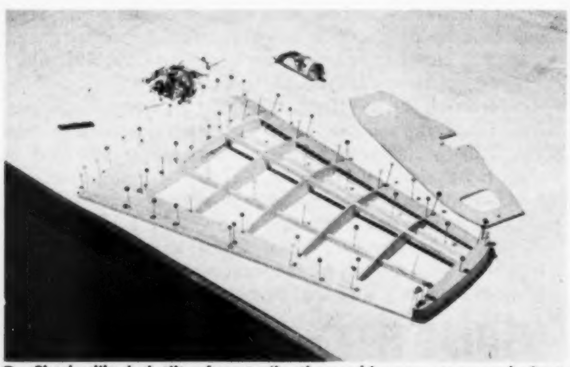
Pictures and plan on following 2 pages



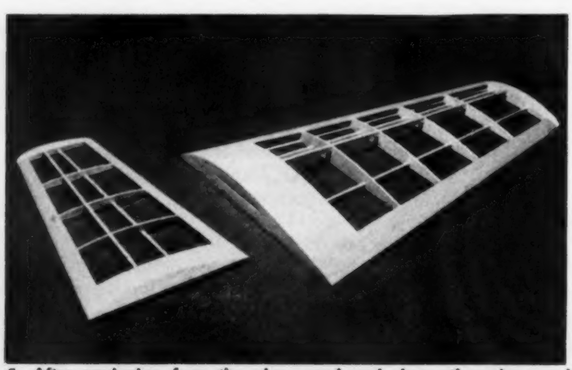
1 Study this photograph in conjunction with the plan to clarify the shapes of sheet parts required to construct the fuselage.



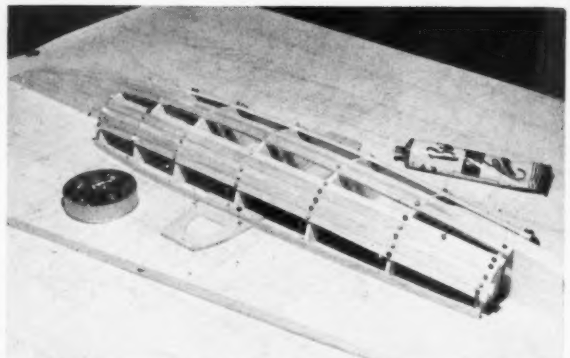
2 Flat sectioned wings are built flat on plan. After pinning the edges, lower spars, in place, follow with ribs and wing box.



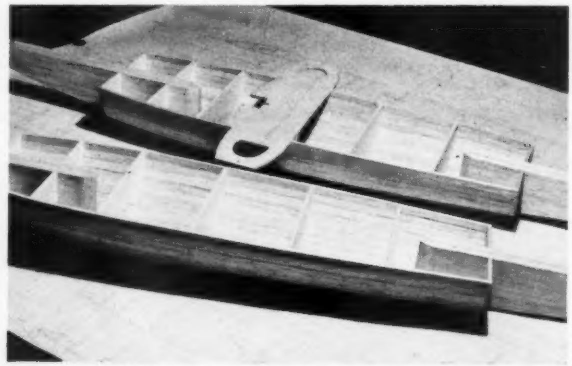
3 Check dihedral tilt of root rib, then add upper spar and sheeting at edges, at center. Tip block shaped, cemented in place.



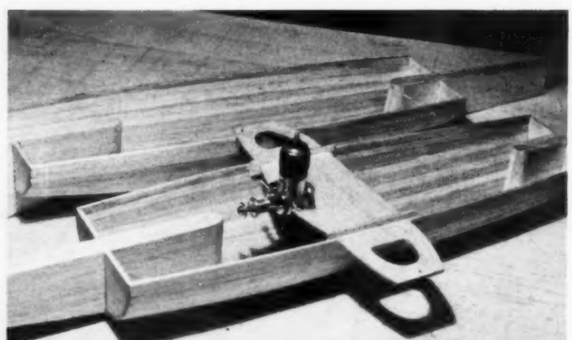
4 After unpinning from the plan, sand and shape the edges and tips. The stabilizer panels cemented together at the root ribs.



5 Pin the lower profile fuselage half upright on the plan, pin wing tongue to plan, spot cement inside assembly formers, plank.

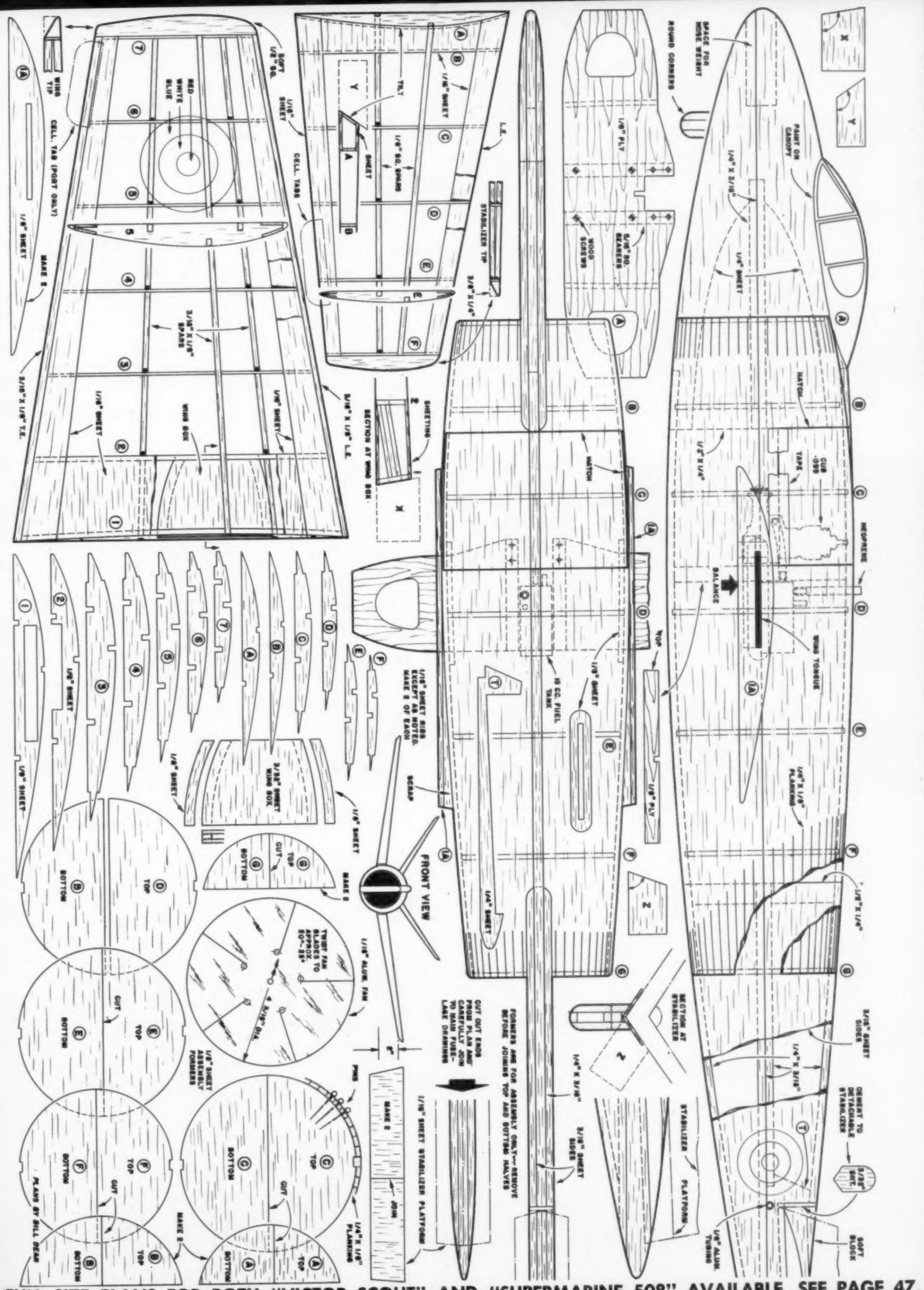


6 All but end formers are removed, as is wing tongue. Screw the engine bearers to tongue, add engine bolts. Re-enforce tongue.



7 Tongue recemented to the fuselage shell and the engine and tank are then bolted in position. Cement shell halves together.

8 Add ribs, spot cement panels for trial, build fairings. Cut out hatch, remove engine, then add neoprene extension and ply strut.

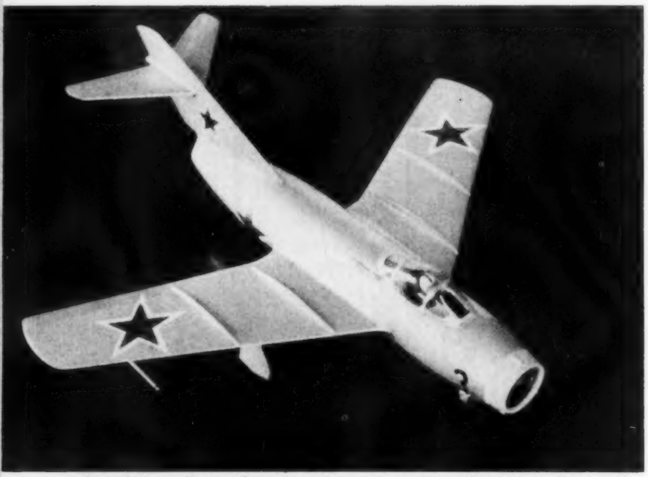


FULL SIZE PLANS FOR BOTH "VICTOR SCOUT" AND "SUPERMARINE 508" AVAILABLE. SEE PAGE 47.

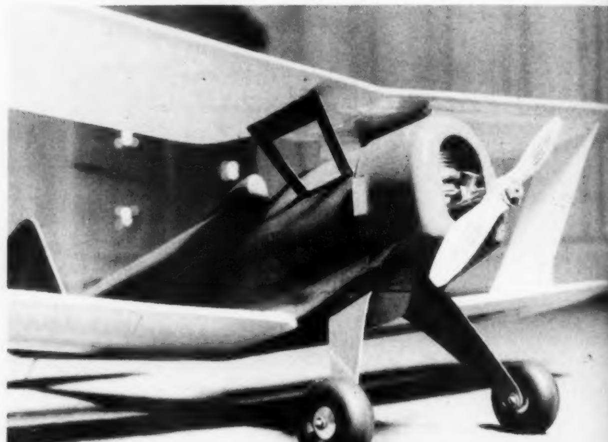
Air Ways

Big trend in world wide modeling is high grade workmanship.

From Rio de Janeiro, Mario Sampaio, sends this shot of fellow club members supervising setting of timer on *Super Phoenix*. Despite the "help" Carlos Coutinho got a two-second run. Happens anywhere.

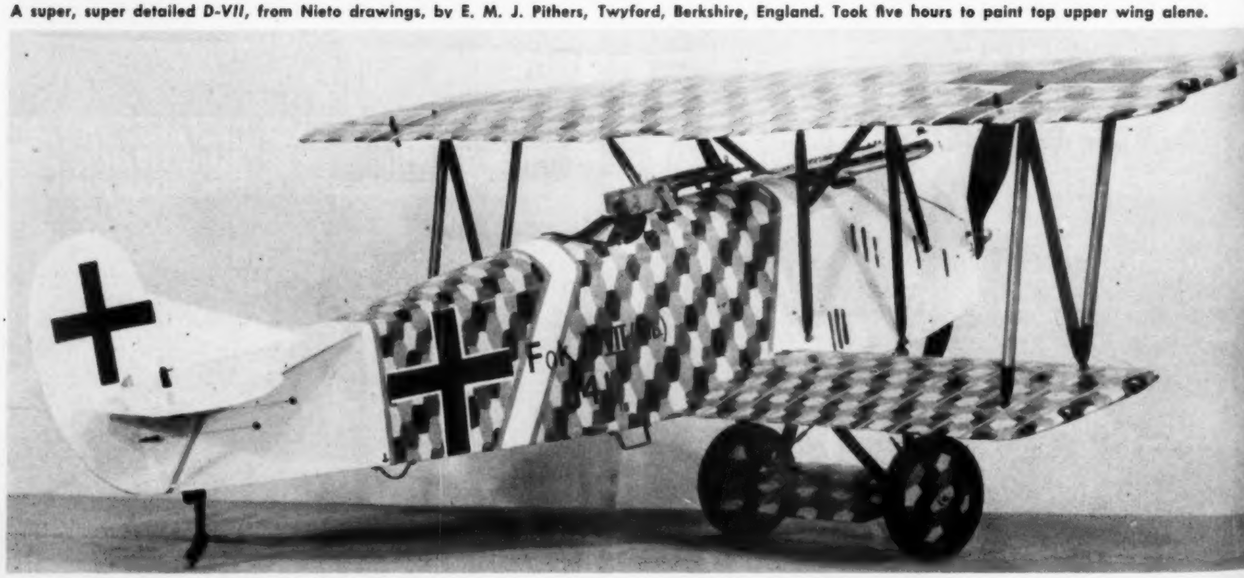


Complete to Boris, the pilot, this neat Russian *Mig-15* is three eight-inch-to-one-foot scale replica of its red-starred full-scale counterpart.



Testor's Avro bipe, *Wasp* .049, built by H. Faranda, flew swell free flight, first crack. Right thrust, left rudder adjustment. Faranda, Bronxville, N. Y.

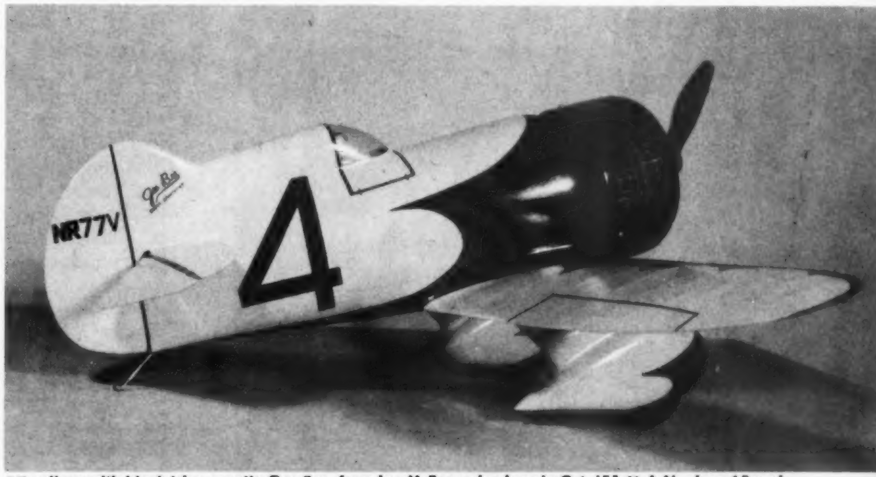
A super, super detailed *D-VII*, from Nieto drawings, by E. M. J. Pithers, Twyford, Berkshire, England. Took five hours to paint top upper wing alone.



Hawker *Demon*, Elfin 1.8 cc power, daringly flown, D. Bryant, South London (Eng.) Scale Club.

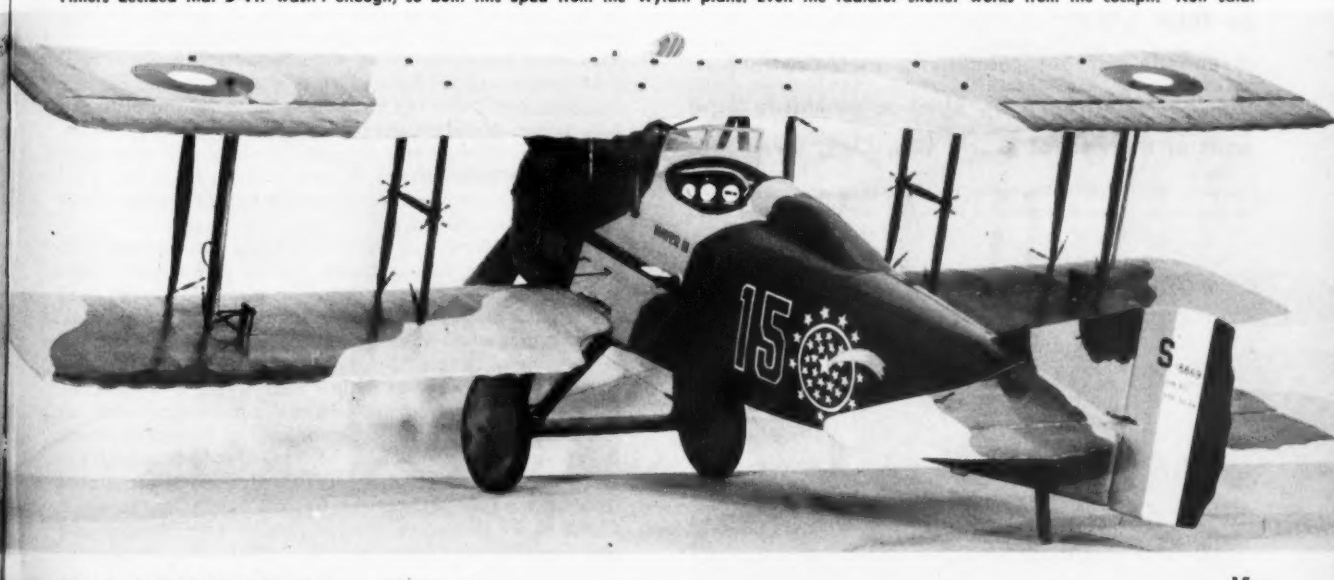
Every rib and false rib, all the stringers, wires, are found on Bryant's *Demon*. Model like these are commonplace in Britain where free flight scale is popular. Practical features worked out too.

From the sublime to the ridiculous, joke controliner, by Belgian modeler Guy Ramaker. Fast!



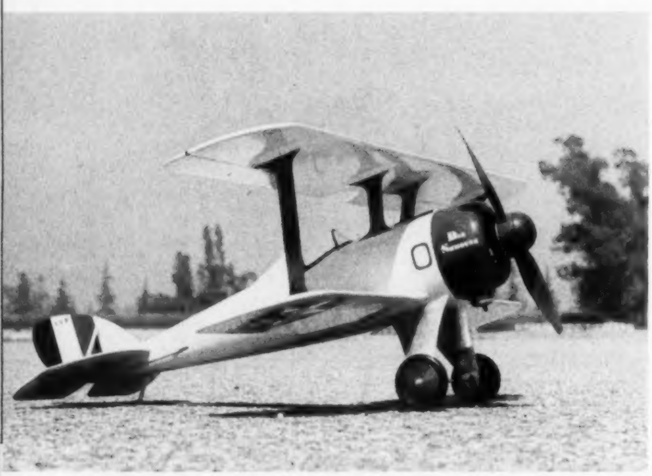
All yellow with black trim, a natty Gee Bee, from Les McBrayer's plans in Oct. '51 M.A.N., does 65 mph plus on Mac 19. By T/Sgt. G. G. Hodger, USAF mission to Guatemala. Reader reports favor this ship.

Pithers decided that *D-VII* wasn't enough, so built this *Spad* from the Wylam plans. Even the radiator shutter works from the cockpit. 'Nuff said.



VICTOR SCOUT

You, too, will squint if you achieve shining finish like the one on author's ship. Power .09 to .14. Fully cowled engine and Cessna type gear were features many years ahead of their time in aviation.

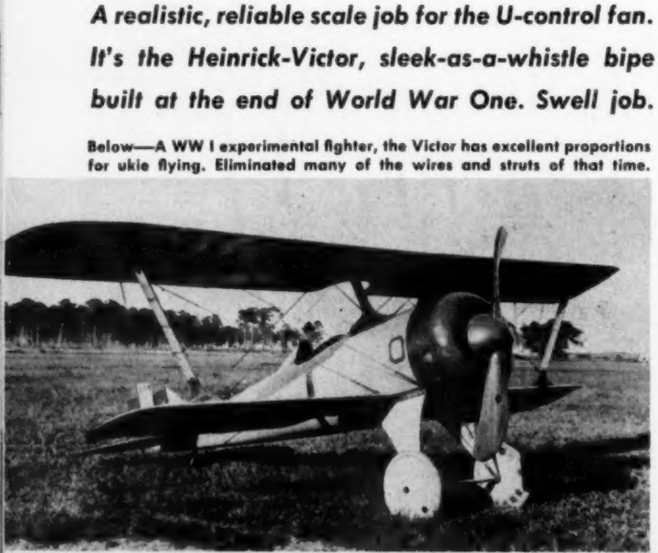


The little Victor looks even better than real thing in this revealing photo. Old style star insignia and red-white-and-blue rudder stripes look real.

By DICK EALY

A realistic, reliable scale job for the U-control fan. It's the Heinrick-Victor, sleek-as-a-whistle bipe built at the end of World War One. Swell job.

Below—A WW I experimental fighter, the Victor has excellent proportions for ukie flying. Eliminated many of the wires and struts of that time.



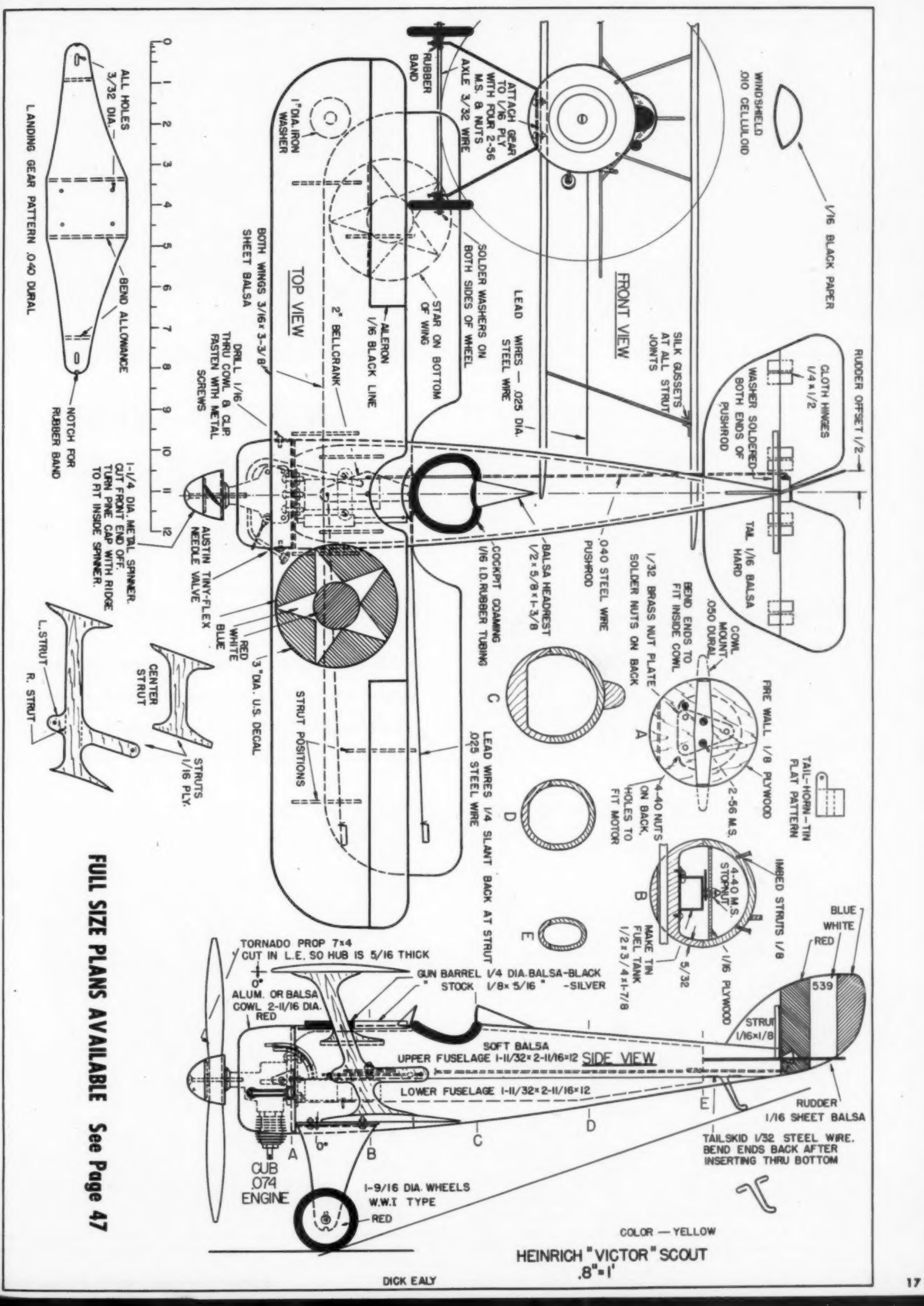
The Victor Scout was an experimental pursuit fighter plane produced in November, 1917 for the U. S. It had advanced streamlining for its time and performance was over 100 mph with a Gnome 90 h.p. engine. A blunt but rounded spinner covered the prop hub and a tight fitting cowl similar to an N.A.C.A. type faired the engine into a round monocoque wood fuselage.

The model was designed by the author, and built and flown by Richard Jameson. The faired landing gear and single "I" type wing struts contribute to make a sleek looking W.W. I fighter. It is .8" to 1' scale, and powered by an .074 *Cub* engine which flies the ten oz. plane easily, although engines up to the new .14 *Cub* engine may be used. The ship takes off quickly and looks like the real thing in the air. A shock absorbing landing gear gives smooth and gentle landings.

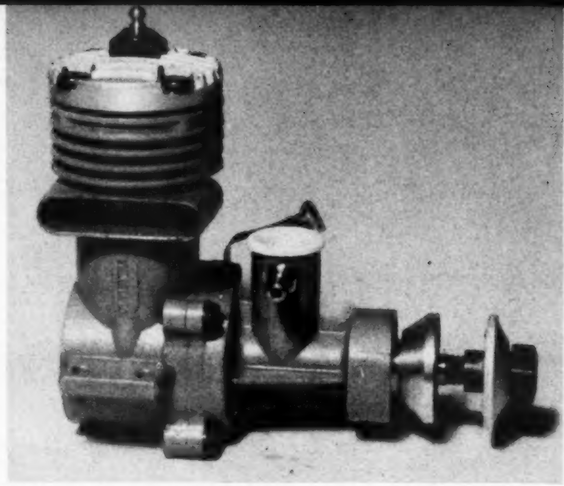
Two soft balsa blocks, each 1-11/32" x 2-11/16" x 12" are tack cemented together. Draw profile and saw away surplus wood. Sand surface smooth. Draw top pattern on block and saw away surplus wood; sand smooth. Use knife to carve corners off to sections shown. Sand paper smooth with 2-0. Separate balsa blocks and gouge inside as shown. Cut cockpit hole in top block. Attach 2" bellcrank to 1/16" x 1-1/4" x 2-1/4" plywood mount with 4-40 machine screws and stop nuts. Cement plywood into upper shell. Make tail from 1/16" hard sheet balsa and round edges with sand paper. Install cloth hinges and tail horn which is wrapped around elevator and cemented. Insert tail in fuselage and cement in place and add rudder. Make tin gas tank 1/2" x 3/4" x 1-7/8" and solder 3/8" tin mounting strap as shown. Secure to fuselage bottom with small screws as shown. Bend up 1/32" steel wire loop in tailskid and insert through bottom fuselage. Bend ends as shown and cement.

Attach .025 steel lead wires to bellcrank and let them stick out. Cement two fuselage blocks together permanently. Make 1/8" plywood firewall and attach tin nut plate to rear, cowl clip to front as shown with two 2-56 machine screws and nuts. Cement firewall to fuselage. Attach engine with 4-40 machine screws.

Both wings are cut to outline from 3/16" x 4" medium balsa stock. Use blockplane to shape airfoil. Sand with 2-0 and #400 paper. Remove section of fuselage bottom to cement lower wing in place. Bottom of wing should be parallel to split line of fuselage. Make 1/16" plywood struts. Imbed center struts 1/8" and cement. Cement upper wing to struts. Check to see bottom of wing is parallel with fuselage split line. Cement outer struts. Add silk (*Continued on page 46*)


FULL SIZE PLANS AVAILABLE See Page 47
HEINRICH "VICTOR" SCOUT
.8"=1'
DICK EALY
COLOR — YELLOW
FRONT VIEW
TOP VIEW
SIDE VIEW
WINDSHIELD .010 CELLULOID
1/16 BLACK PAPER
RUDDER OFFSET 1/2
CLOTH HINGES 1/4 x 1/2
WASHER SOLDERED BOTH ENDS OF PUSHROD
SILK GUSSETS AT ALL STRUT JOINTS
LEAD WIRES — .025 DIA. STEEL WIRE
ATTACH GEAR TO 1/16 PLY WITH FOUR 2-56 M.S. & NUTS
AXLE 3/32 WIRE
RUBBER BAND
SOLDER WASHERS ON BOTH SIDES OF WHEEL
STAR ON BOTTOM OF WING
1" DIA. IRON WASHER
AILERON 1/16 BLACK LINE
2" BELLCRANK
BOTH WINGS 3/16 x 3-3/8 SHEET BALSA
DRILL 1/16 THRU COWL & CLIP. FASTEN WITH METAL SCREWS
TAIL 1/16 BALSA HARD
.040 STEEL WIRE PUSHROD
BALSA HEADREST 1/2 x 5/8 x 1-3/8
COCKPIT COAMING 1/16 I.D. RUBBER TUBING
1/32 BRASS NUT PLATE. SOLDER NUTS ON BACK
BEND ENDS TO FIT INSIDE COWL
COWL MOUNT .050 DURAL
FIRE WALL 1/8 PLYWOOD
2-56 M.S.
4-40 NUTS ON BACK. HOLES TO FIT MOTOR
TAIL-HORN-TIN FLAT PATTERN
IMBED STRUTS 1/8
4-40 M.S. STOPNUT
MAKE TIN FUEL TANK 1/2 x 3/4 x 1-7/8
5/32
1/16 PLYWOOD
A
B
C
D
E
RED
WHITE
BLUE
3" DIA. U.S. DECAL
STRUT POSITIONS
LEAD WIRES 1/4 SLANT BACK AT STRUT .025 STEEL WIRE
1-1/4 DIA. METAL SPINNER. CUT FRONT END OFF. TURN PINE CAP WITH RIDGE TO FIT INSIDE SPINNER.
AUSTIN TINY-FLEX NEEDLE VALVE
0 1 2 3 4 5 6 7 8 9 10 11 12
ALL HOLES 3/32 DIA.
BEND ALLOWANCE
NOTCH FOR RUBBER BAND
LANDING GEAR PATTERN .040 DURAL
L. STRUT
R. STRUT
CENTER STRUT
STRUTS 1/16 PLY.
TORNADO PROP 7x4 CUT IN L.E. SO HUB IS 5/16 THICK
GUN BARREL 1/4 DIA. BALSA-BLACK
" STOCK 1/8 x 5/16 " -SILVER
ALUM. OR BALSA COWL 2-11/16 DIA.
RED
SOFT BALSA
UPPER FUSELAGE 1-11/32 x 2-11/16 x 12
LOWER FUSELAGE 1-11/32 x 2-11/16 x 12
539
STRUT 1/16 x 1/8
RUDDER 1/16 SHEET BALSA
TAILSKID 1/32 STEEL WIRE. BEND ENDS BACK AFTER INSERTING THRU BOTTOM
0°
CUB .074 ENGINE
1-9/16 DIA. WHEELS W.W.I TYPE
RED

Norwegian modeler-manufacturer Jan David-Anderson checks one of his .15 cu. in. displacement diesels. About 1,000 well-made units yearly.

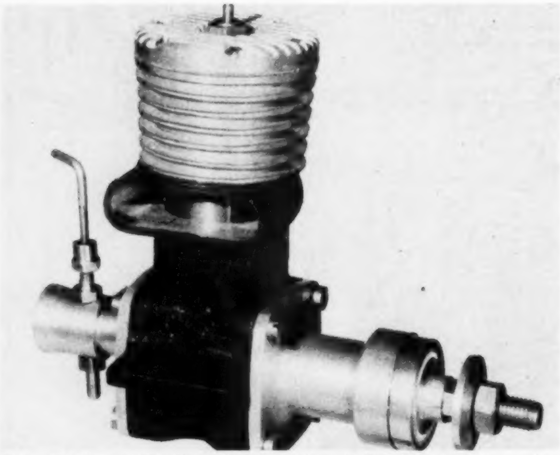


Truly world famous is Italian *Super-Tigre* series. This .15, G.20 speed engine features interchangeable venturis for speed, stunt, free flight.

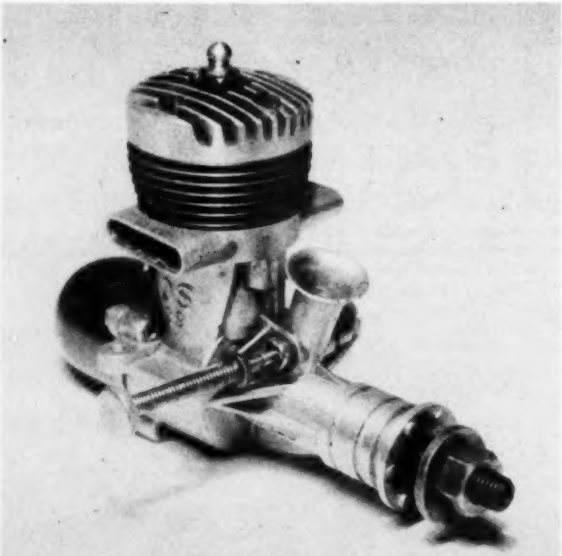
WORLD-WIDE ENGINE ROUND-UP

By PETER CHINN

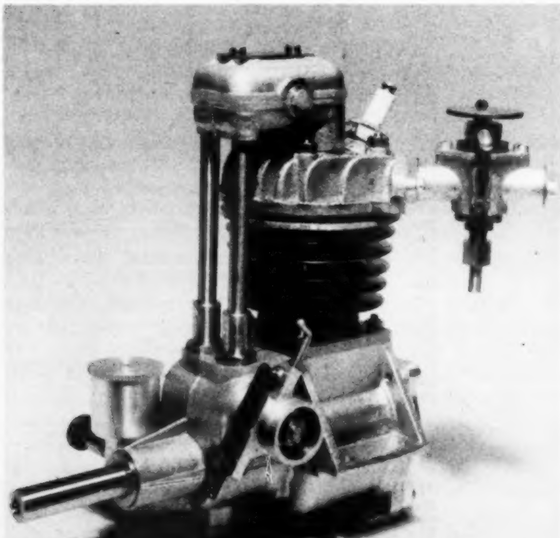
With the rapidly growing emphasis on international competition American modelers will want to know about the "hot" engines of other lands. All but American-British types here covered.



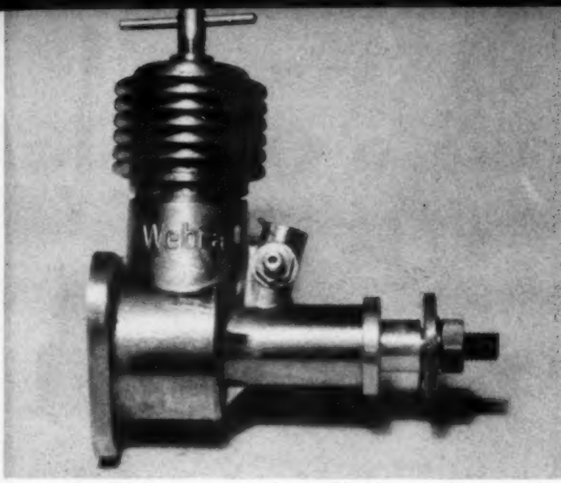
Flying Dutchman. Big *Super-Typhoon* from Holland has regular racing engine features. Has hit 148 mph. Glow engine, it looks like a McCoy.



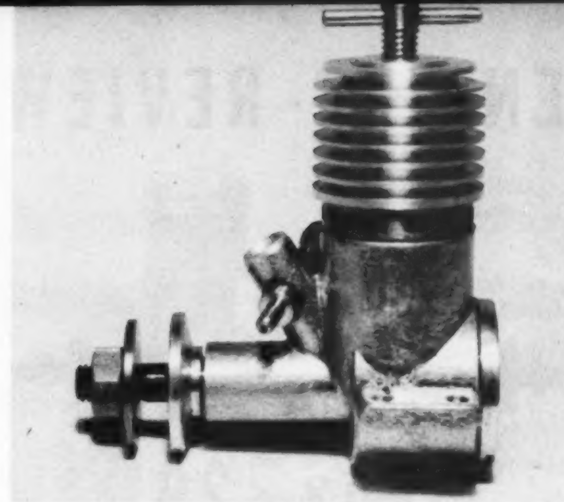
Now available in the U.S., thanks to Bill Atwood, is the Japanese O.S. .29, impressive looking, front-rotary glow engine. Has original features.



Channel Islander. Four-cycle overhead valve Jensen .60 is built like a real engine and runs on straight gas. Note carburetor, points, pushrod.



Outstripping all other German makes combined is the German *Webra* 2.46, or .15 according to our system. Also .09. Starts easily, is powerful.

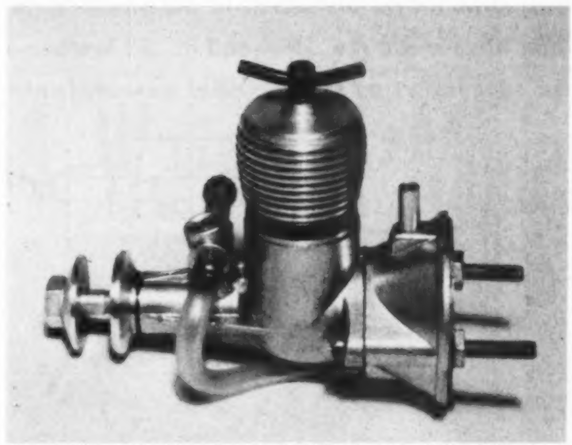


Another Dutch engine is this *Typhoon* diesel, high performance job designed to the 2.5cc formula. Dutch racing engines turn at 14,000-17,500.

▸ Countries outside the United States and Great Britain do not produce model airplane motors on a large scale. We are omitting engines built in the United Kingdom, since most of these were covered in the April 1952 M.A.N. article "Johnny Bull's Engines." Both in Italy and in France there is a fair production, but in some other European countries, the market is sometimes held by just one or two makers producing, perhaps, a thousand units per year. Least settled of all seems to be Germany, where many types have been announced but few have reached the market in any numbers.

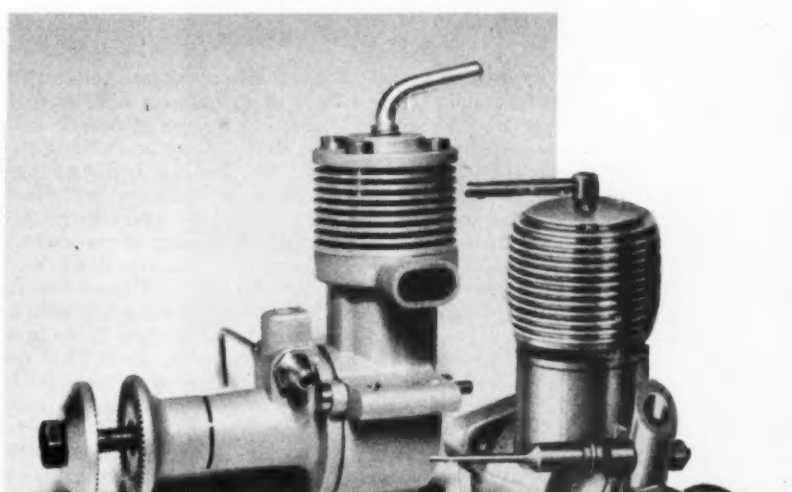
It is not surprising to find that, in Continental Europe, which bred and raised it, the model diesel is very popular. Nevertheless, the glowplug motor has quite a big following, particularly in Italy and France where more than half the engines now on the market are glow jobs.

To start with one of the best known European makes, we will take a look at the Italian *Super-Tigre* range. Personally, we have a soft spot for the *Super-Tigre,* dating back to just after World War II, when, awaiting our transfer back home, we managed to persuade the distributor in Cremona to part with two early examples of *(Continued on page* 40)



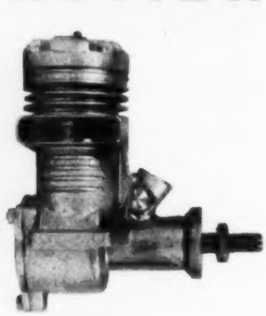
Atwood-*Waspish* looking diesel is the .091 Gee Bee *Sabre 150,* manufactured in Australia. About half dozen makes turned out in that country.

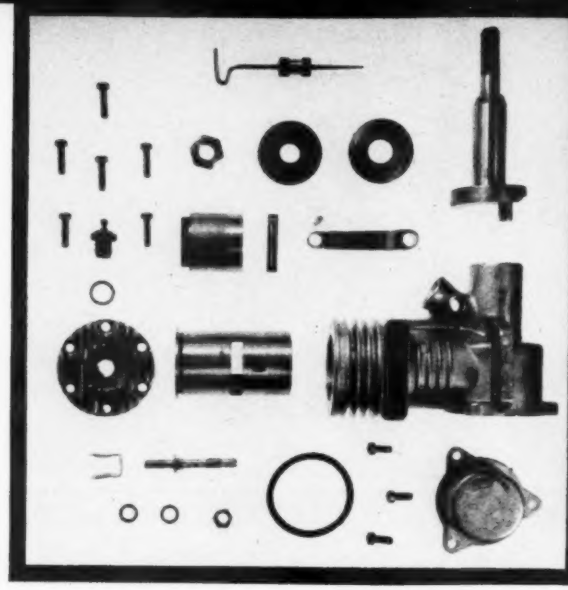
The French Micron 10 gas engine has auto-type points on plate at back of crankcase. Glow also is available.



Above, left—Norway's rugged David-Anderson .15 diesel. Above, right—The *Meteore* is French contribution to 2.5 international class. Note fuel feed at needle valve body.

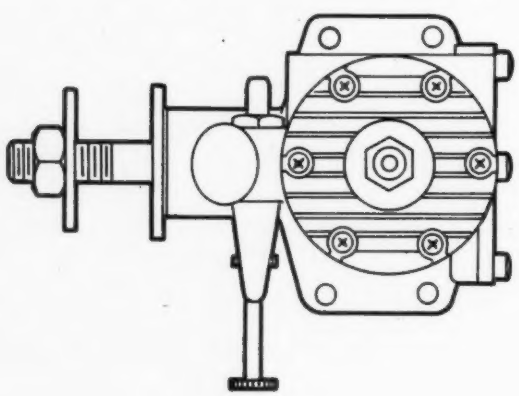
ENGINE REVIEW



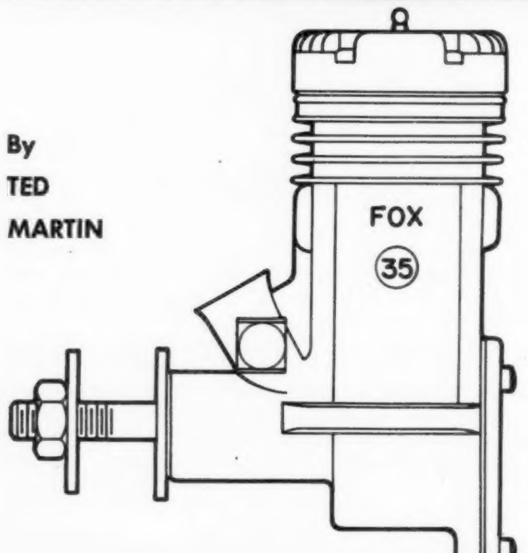


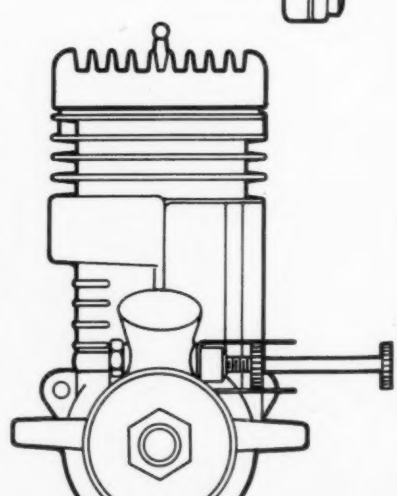
Fox .29

An authoritative discussion of the many factors that have made the .29—and its .35 brother—so successful as stunt model powerplants.



By TED MARTIN





▸ The Fox .29 and its overbored companion, the .35, are aimed at stunt U-control; the fact that they are Spartan engines with no luxurious plated fittings and eye-catching color schemes means nothing when you see them perform. In common with its full size counterpart, the modern model engine has to be specifically aimed at some particular application. The days of the general purpose power unit are now but happy memories. As a stunt engine, the Fox is renowned. Why?

The Fox is very lightweight for its displacement and this permits a light model. This saving in weight offers the alternatives of a smaller wing area to achieve a pre-determined wing loading and, reduced drag and increased speed, or instead, retain a normal wing area with the advantages of the most exceptional maneuverability, owing to low wing loading. To realize this advantage demands rock steady carburation so that power output remains constant, regardless of the variable head of fuel occasioned by changes of attitude and therefore tank position in violent maneuvers. The Fox has this important property; while to the casual eye, it just looks like any other front rotary setup, there are actually a number of important small details which make the difference. When one considers that the ideal fuel/air in an alcohol burning engine is around one part fuel to eight of air by weight (in other words, about 5000 times as much air as fuel by volume), it is understandable that minute details in carburetor design can have a vital effect on overall efficiency. However, the main requirement of a stunt carburetor is that it should exert a powerful suction sufficient to overcome fuel inertia set up by the 'G' effect of violent maneuvers.

Three factors in the Fox contribute towards this ideal condition. First, rotary valve timing *(Continued on page 52)*

Geodetic construction resists warping of wing, tail. Cut-out fin allows pop-up tail, 35 degrees for D/T action, fuse operated. Wings strut braced, landing gear plugs in. Skysail, Jap tissue covering.

by RON WARRING
1952 British Team Member

▼

When the Wakefield rules were radically revised to limit motor weight to 2.82 ounces, MAN asked one of the world's most respected designers and writers on the subject to prepare this analysis and accompanying plane drawings. Plans of the model on the following two pages.

The 1954 Wakefield Model

▶ Starting with the 1954 Wakefield there is one major change in the specification. Size and minimum total weight of model remains as before but motor weight is to be restricted to a *maximum* of 80 grams of rubber (lubricated). It is not the purpose of this article to discuss whether the rule change is a good one or not (although my personal opinion is that it is a very bad one), but rather to examine the effect this new rule will have on Wakefield design.

For a start it will put a premium on good rubber. Limited to 80 grams or 2.82 ounces lubricated rubber weight, only the best rubber will do. The weight rule is equivalent to a maximum of just about 40 feet of lubricated 1/4 x 24 Perelli strip which I use and which will make up into the following motors:
12 strands—40" long made up. 44" long when broken in.
14 strands—34-1/2" long made up. 38" long when broken in.
16 strands—30" long made up. 33" long when broken in.

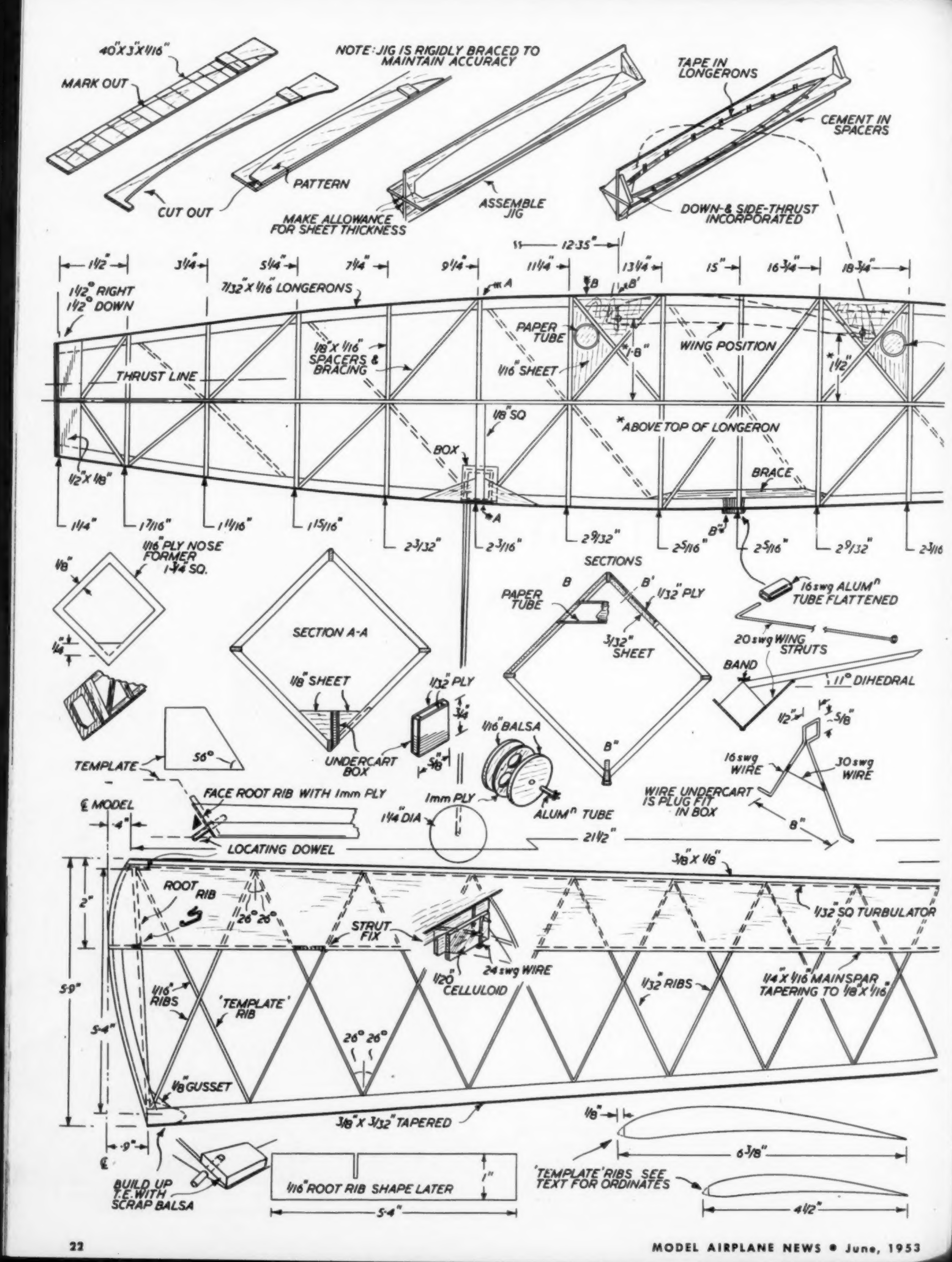
These possible motor lengths seem to indicate pretty clearly that both the long fuselage Wakefield and return-gear designs are ruled out for new Wakefields. The object of both these layouts is to use motors in a taut state in the fuselage. We can now use taut motors, if we wish, in fuselages of average length without the extra vulnerability of the long fuselage or complication of gears.

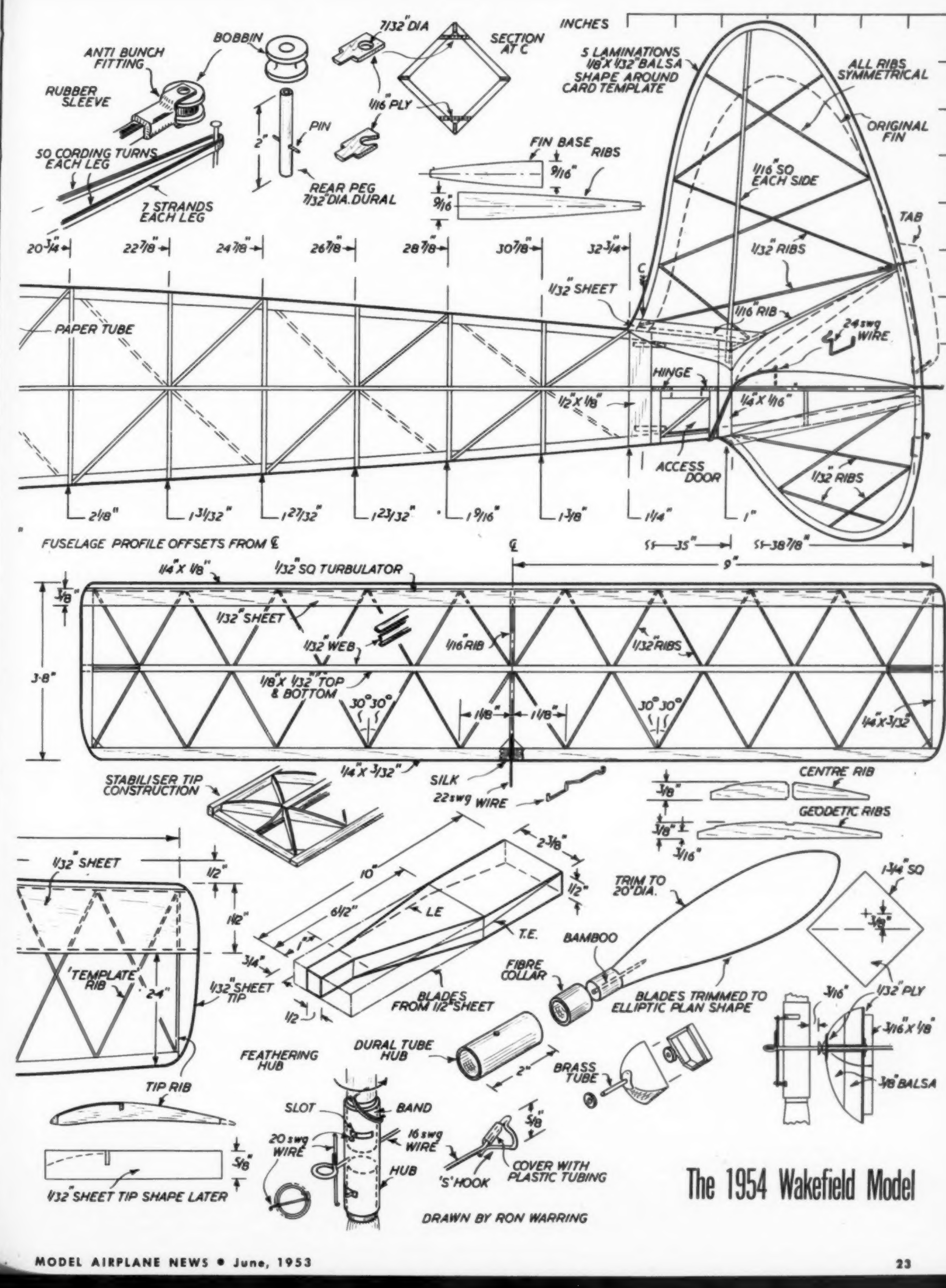
Modern Wakefields with 12 strand motors are capable of excellent and consistent performances even in poor conditions, but have relied very much on a *long power run* to ensure a four minute plus duration. Since we cannot now use a *long*, low power (i.e. small cross-section) motor, it becomes doubtful that anything less than a 14 strand motor will do. This can be accommodated taut between hook distances equal to 38" when fully broken in, which will probably set a standard for the longest fuselage lengths likely under the new rules. Such a motor will then take around 1,000 turns.

Before ruling out the geared model entirely, there is the possibility of splitting this 38" motor length into two 19" motors, and a short fuselage design with necessary tail moment given by a long tail boom carrying fin and stabilizer. This could duplicate, to a certain *(Continued on page* 47)

Plan on following 2 pages

Author's 1954 design follows closely 1952 layout, with single skein motor, 20 in. feathering prop. Shoulder wing, diamond fuselage efficient.

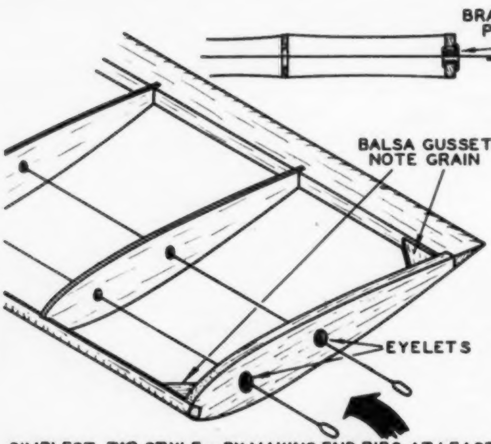

40" X 3" X 1/16"
MARK OUT
CUT OUT
NOTE: JIG IS RIGIDLY BRACED TO MAINTAIN ACCURACY
PATTERN
MAKE ALLOWANCE FOR SHEET THICKNESS
ASSEMBLE JIG
TAPE IN LONGERONS
CEMENT IN SPACERS
DOWN- & SIDE-THRUST INCORPORATED
12·35"
1 1/2"
3 1/4"
5 1/4"
7 1/4"
9 1/4"
11 1/4"
13 1/4"
15"
16 3/4"
18 3/4"
1 1/2° RIGHT
1 1/2° DOWN
7/32" X 1/16" LONGERONS
A
B
B'
PAPER TUBE
WING POSITION
*1·8"
*1 1/2"
1/8" X 1/16" SPACERS & BRACING
1/16" SHEET
THRUST LINE
1/8" SQ
*ABOVE TOP OF LONGERON
BOX
BRACE
1/2" X 1/8"
1 1/4"
1 7/16"
1 11/16"
1 15/16"
2 3/32"
2 3/16"
2 9/32"
2 5/16"
B"
2 5/16"
2 9/32"
2 3/16
1/16" PLY NOSE FORMER 1 3/4" SQ.
1/8"
1/4"
SECTION A-A
1/8" SHEET
UNDERCART BOX
1/32" PLY
3/4"
5/8"
SECTIONS
B
B'
PAPER TUBE
1/32" PLY
3/32" SHEET
B"
16 swg ALUMn TUBE FLATTENED
20 swg WING STRUTS
BAND
11° DIHEDRAL
1/2"
5/8"
16 swg WIRE
30 swg WIRE
WIRE UNDERCART IS PLUG FIT IN BOX
8"
TEMPLATE
56°
1/16" BALSA
1mm PLY
ALUMn TUBE
1 1/4" DIA
FACE ROOT RIB WITH 1mm PLY
℄ MODEL
·4"
LOCATING DOWEL
21 1/2"
3/8" X 1/8"
ROOT RIB
2"
26° 26°
STRUT FIX
1/32" SQ TURBULATOR
24 swg WIRE
1/20" CELLULOID
1/32" RIBS
1/4" X 1/16" MAINSPAR TAPERING TO 1/8" X 1/16"
5·9"
5·4"
1/16" RIBS
'TEMPLATE' RIB
26° 26°
1/8" GUSSET
3/8" X 3/32" TAPERED
1/8"
6 3/8"
·9"
℄
BUILD UP T.E. WITH SCRAP BALSA
1/16" ROOT RIB SHAPE LATER
1"
5·4"
'TEMPLATE' RIBS SEE TEXT FOR ORDINATES
4 1/2"

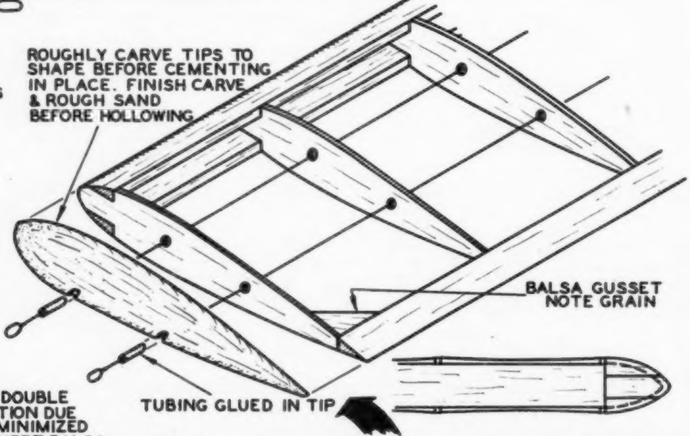


The 1954 Wakefield Model

design detail

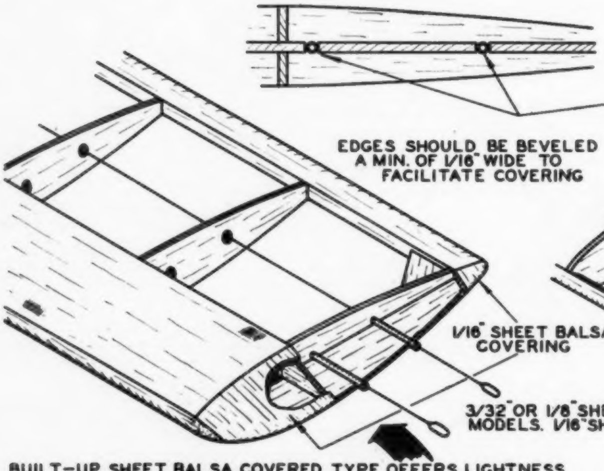
Wing Tips for Stunt Models

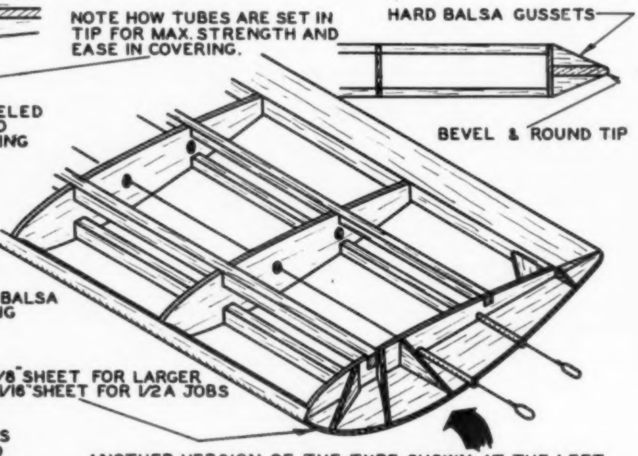




SIMPLEST TIP STYLE—BY MAKING END RIBS AT LEAST DOUBLE THE THICKNESS OF OTHER RIBS IN THE WING, DISTORTION DUE TO TIGHTNESS OF THE COVERING MATERIAL CAN BE MINIMIZED OR COMPLETELY ELIMINATED. QUARTER-GRAINED SHEET BALSA SHOULD BE USED FOR MAX. STRENGTH. GUSSETS SHOULD BE USED AT THE LEADING AND TRAILING EDGES. RECOMMENDED FOR THE MORE ELEMENTARY STUNT-TRAINERS WHERE APPEARANCE IS OF MINOR IMPORTANCE.

SOFT SOLID BALSA BLOCK STYLE IS VERY SIMPLE TO MAKE. OFFERS GOOD STRENGTH AND FINISHED APPEARANCE. 1/16" OR 1/8" I.D. ALUMINUM OR BRASS TUBING CEMENTED IN THE TIP, PREVENT CHAFING. SODA STRAWS MAY BE USED IN PLACE OF TUBING FOR 1/2 A MODELS. TIPS MAY BE HOLLOWED FOR LIGHTNESS. FOR MAXIMUM STRENGTH TIP, MAY BE LAMINATED FROM TWO OR MORE SHEETS.





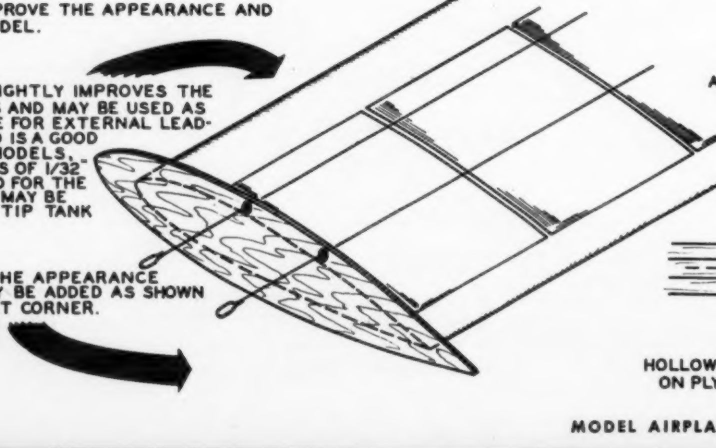
BUILT-UP SHEET BALSA COVERED TYPE OFFERS LIGHTNESS AND STRENGTH BUT REQUIRES MORE BUILDING TIME AND HAS A "BOXY" APPEARANCE. THIS TYPE MAY HAVE ONLY THE LEADING AND TRAILING PORTIONS COVERED OR IT MAY BE COMPLETELY SHEETED, NOTE GRAIN DIRECTION.

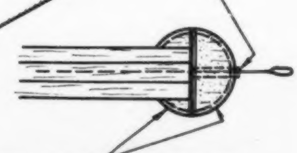
ANOTHER VERSION OF THE TYPE SHOWN AT THE LEFT. ENTIRE TIP TO BE COVERED WITH THE SAME MATERIAL AS USED ON MAIN PORTION OF WING. GUSSETS AT THE LEADING EDGE SHOULD BE PLACED APPROXIMATELY AS SHOWN TO SIMPLIFY COVERING AND REDUCE THE SAG.

WELL DESIGNED TIPS IMPROVE THE APPEARANCE AND PERFORMANCE OF A MODEL.

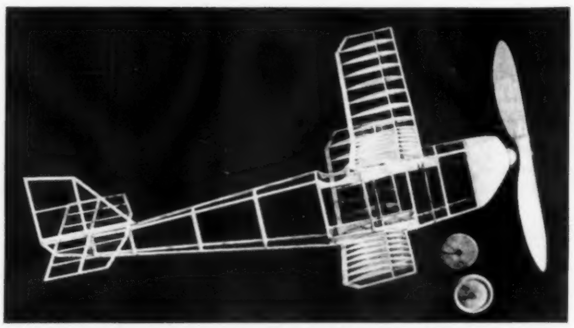
VORTEX PLATE STYLE SLIGHTLY IMPROVES THE EFFICIENCY OF THE WING AND MAY BE USED AS NEAT-LOOKING TIP GUIDE FOR EXTERNAL LEAD-OUT WIRES. 1/16" PLYWOOD IS A GOOD MATERIAL FOR LARGER MODELS, WHILE TWO LAMINATIONS OF 1/32" THICK BALSA MAY BE USED FOR THE SMALL JOBS. THIS TYPE MAY BE SHAPED TO SIMULATE A TIP TANK AS SHOWN.

TO FURTHER IMPROVE THE APPEARANCE SOFT BALSA BLOCKS MAY BE ADDED AS SHOWN IN DETAIL IN LOWER RIGHT CORNER.





Ruggedly built, featuring demountable wings—top wing can be moved for adjustment—this cute bipe will last almost indefinitely. Prop free-wheels.



One skeleton that won't stay in a closet! Old saying that covering hides a multitude of sins isn't true here. Can be built on a bread board.

This is one of those rare airplanes, well designed, easy to make and fly, that appeals to experts and beginners alike.

Colored paper over the nose block, prop doped to shine, painted wheels, insignia and strips from colored tissues are well worth while touches.

SURE FLIER

by SHERMAN GILLESPIE

The *Sure Flier* is a simple, easy-to-build biplane designed to give maximum in rubber-power flying pleasure with a minimum of construction and adjustment difficulties. Ruggedly built and featuring detachable wings, this little model will prove a long-lived addition to your string of ships. Before beginning work, study plans, photos and construction notes carefully.

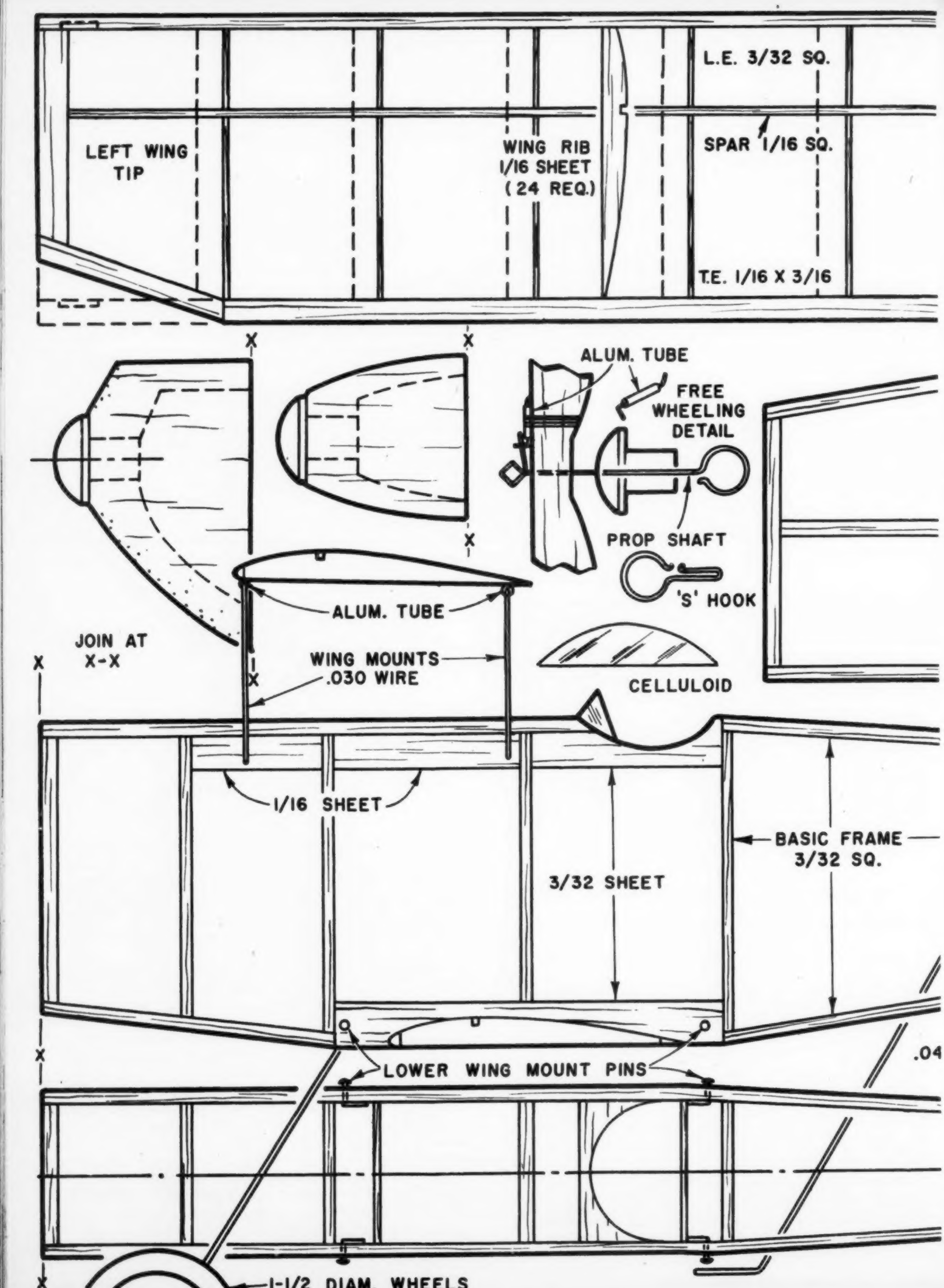
Sand all balsa wood before laying out any parts.

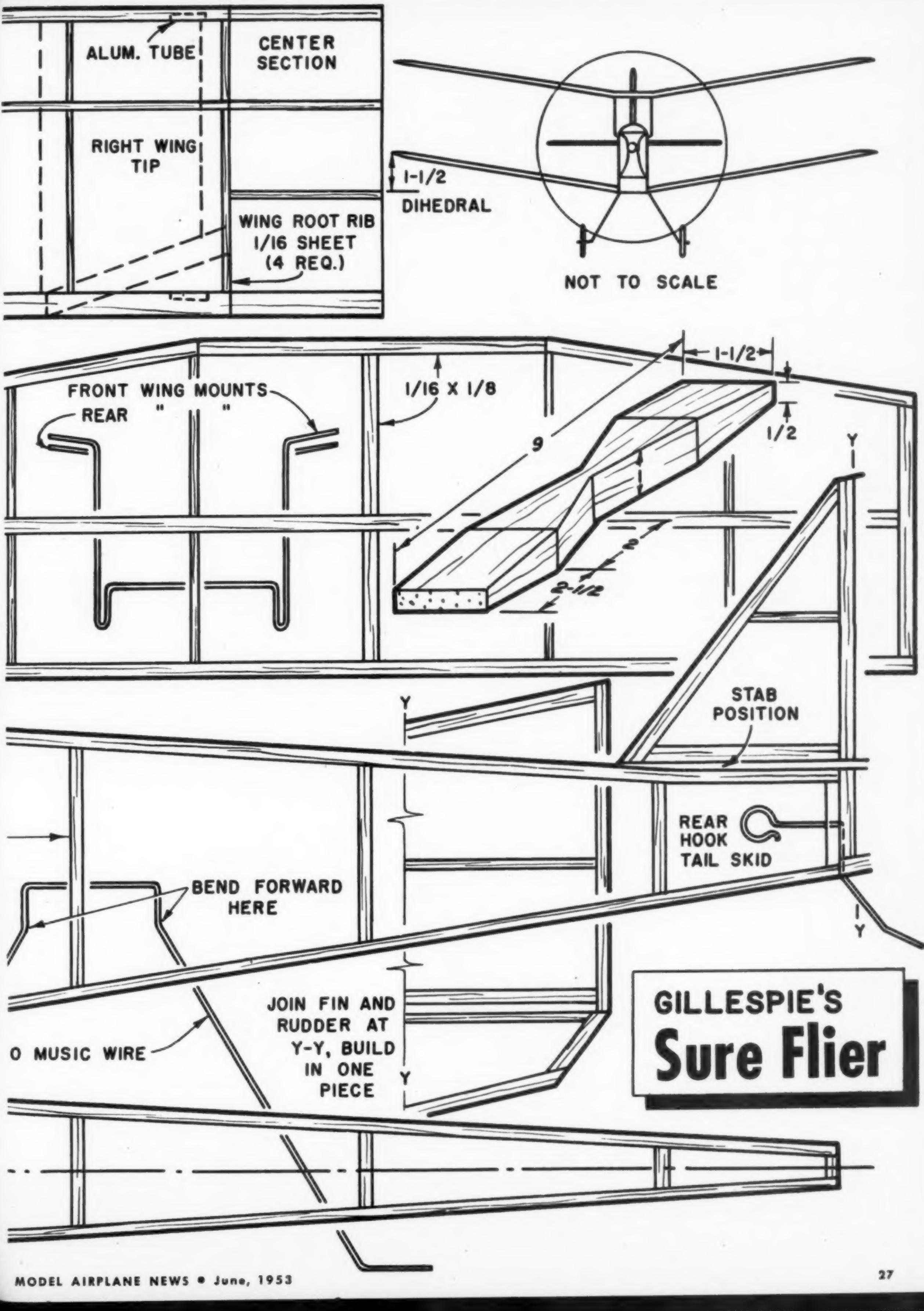
The fuselage is of the orthodox box-type; build two sides of 3/32" square hard balsa. Pin longerons in place first, then lay lower wing receiver pieces and cockpit forming pieces in place; add cross members. Cut all pieces accurately and cement thoroughly; excess cement can be trimmed away before assembling the two sides. Cement 1/16" sheet filler pieces in place, making sure they are flush with outside edges of upper longerons, thus assuring good fitting of upper wing mounts.

Assemble two fuselage sides over top view and add cross pieces. It may be necessary to crack longeron joints slightly to make the bend behind the cockpit. Pin and block fuselage as firmly as possible during assembly because square construction is essential to accurate alignment of wings and tail surfaces.

Rough carve nose section from a medium hard balsa block and drill it to receive removable hardwood nose plug. Hollow out block as indicated and cement (*Continued on page* 44)

Full size plans for Sure Flier will be found on following two pages.


L.E. 3/32 SQ.
LEFT WING TIP
WING RIB
1/16 SHEET
(24 REQ.)
SPAR 1/16 SQ.
T.E. 1/16 X 3/16
X
X
ALUM. TUBE
FREE WHEELING DETAIL
PROP SHAFT
'S' HOOK
X
ALUM. TUBE
JOIN AT X-X
X
WING MOUNTS
.030 WIRE
CELLULOID
1/16 SHEET
BASIC FRAME
3/32 SQ.
3/32 SHEET
.04
LOWER WING MOUNT PINS
1-1/2 DIAM. WHEELS


ALUM. TUBE
CENTER SECTION
RIGHT WING TIP
WING ROOT RIB 1/16 SHEET (4 REQ.)
1-1/2
DIHEDRAL
NOT TO SCALE
FRONT WING MOUNTS
REAR " "
1/16 X 1/8
1-1/2
1/2
9
2
2-1/2
Y
STAB POSITION
REAR HOOK
TAIL SKID
BEND FORWARD HERE
JOIN FIN AND RUDDER AT Y-Y, BUILD IN ONE PIECE
O MUSIC WIRE
GILLESPIE'S
Sure Flier

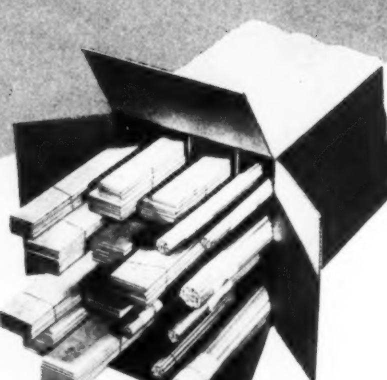
TESTORS

...costs a littl

CEME

...for modelers who want the

INSIST ON THESE OTHER TESTORS MODEL SU TOO...

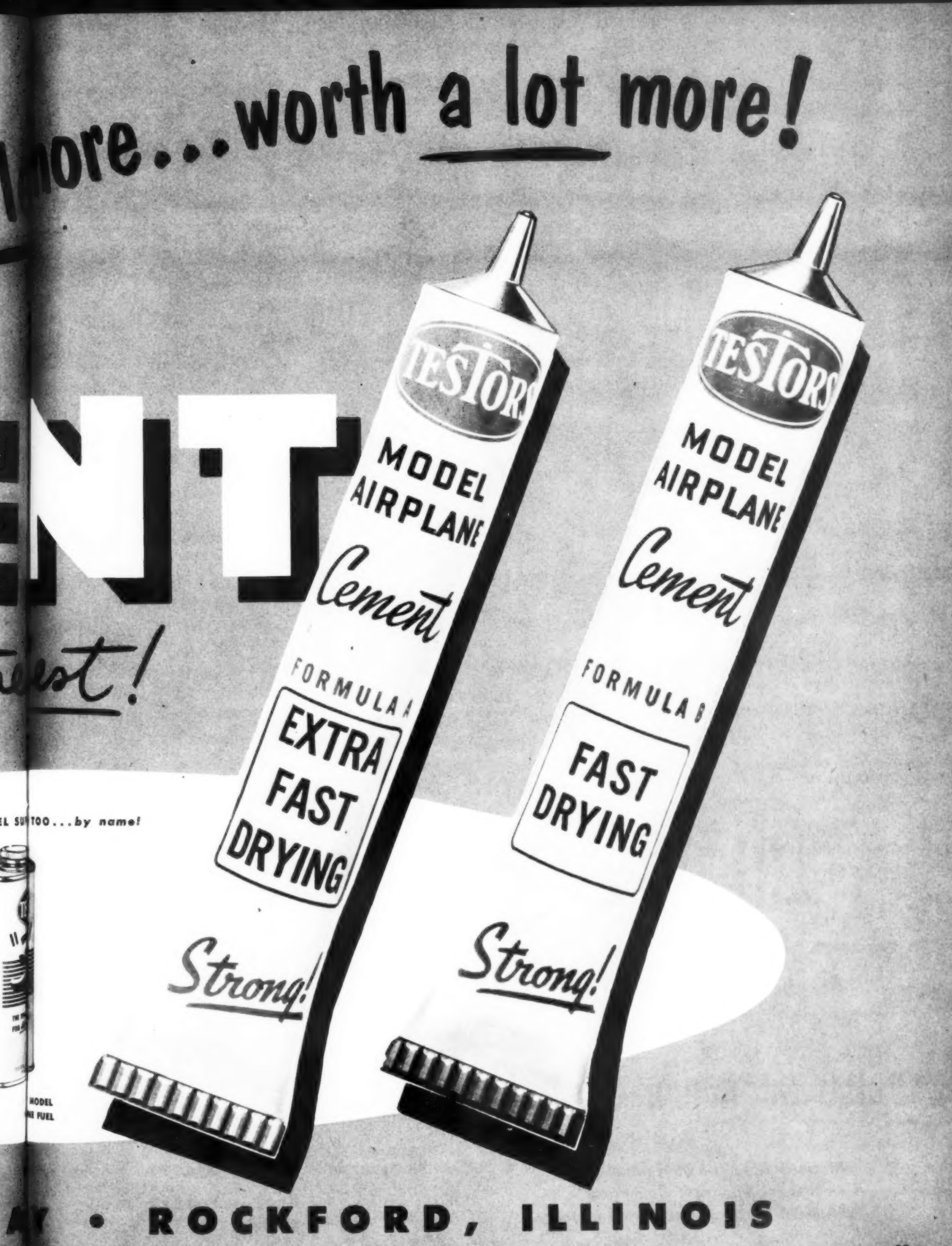


TESTORS
BRANDED BALSA

TESTORS DOPE

MODEL
E FUEL

TESTOR CHEMICAL COMPA


more...worth a lot more!
NT
est!
TOO...by name!
TESTORS
MODEL AIRPLANE
Cement
FORMULA A
EXTRA FAST DRYING
Strong!
TESTORS
MODEL AIRPLANE
Cement
FORMULA B
FAST DRYING
Strong!
MODEL
FUEL
ROCKFORD, ILLINOIS

PULSEQUENCE

Fig 1

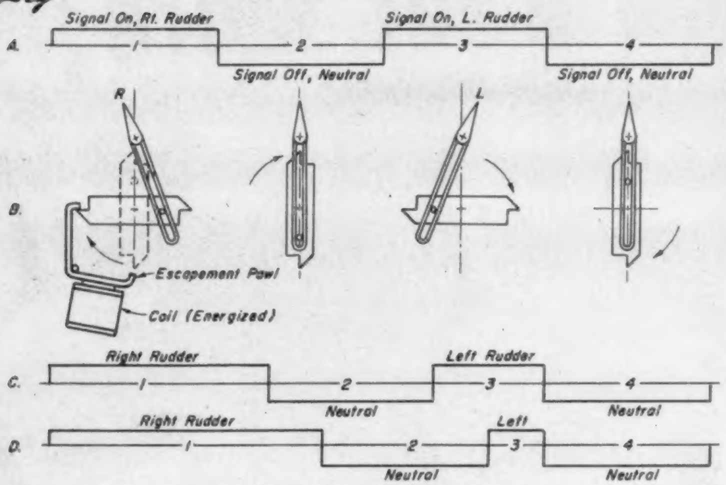


Fig 2

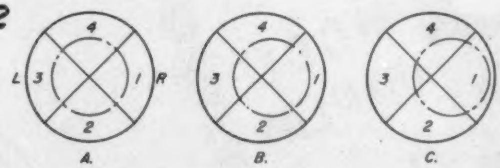


Fig 3

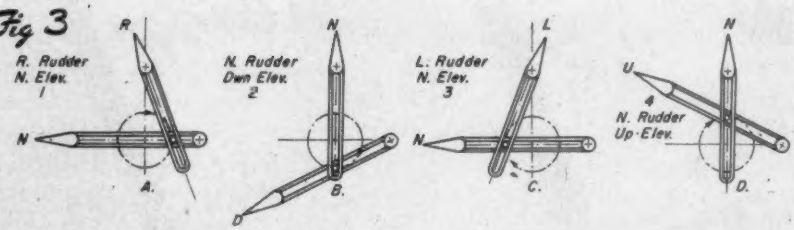


Fig 4

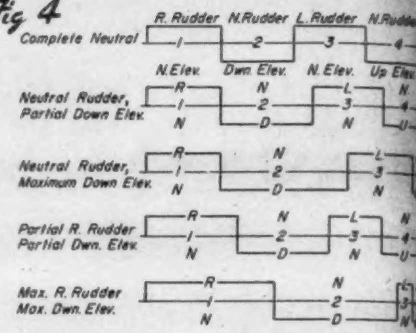
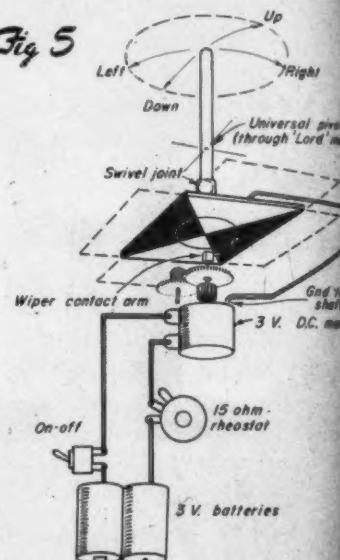


Fig 5



for the R.C. fan

Pulse Sequence Control

By JOHN WORTH

Proportionate rudder and elevator on one channel? An impossibility?—whoa, not too fast!

A great amount of effort has been expended in the development of reliable and simple two control systems for radio controlled models; with the fast growing popularity of the new 27.255 mc equipment, it is natural to expect an increased demand for such a system for single frequency operation. There are a few notable examples of two- or multiple-control systems which have been developed to date. One of these is Rockwood's audio tone control system which can be used for two or more control operations. Others which provide more than one control are Walker's "Poz-Po" system, Howard Bonner's combined rudder and motor speed control utilizing a simple sequence system, the proportional pulse length and rate control system pioneered by Trammel, and the Rudevator developed by Owbridge using a unique sequence actuator to provide more than one control.

Here is offered for your consideration another control system which provides two controls, on one transmitted frequency, with independent or simultaneous proportional action for both! The control system is made possible through a combination of sequence action of an escapement and operation of a pulsing type actuator. From this combination the control system has acquired a name descriptive of the principles involved. Added to the radio control vocabulary, therefore, is the Pulsequence control system.

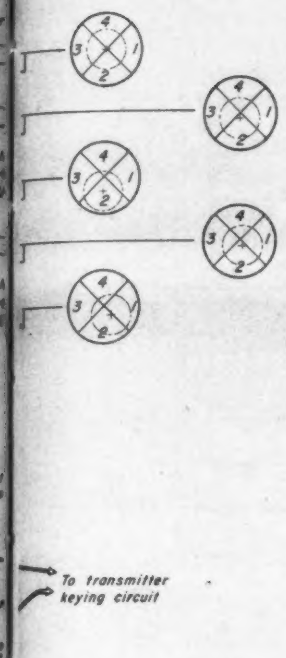


Fig 6

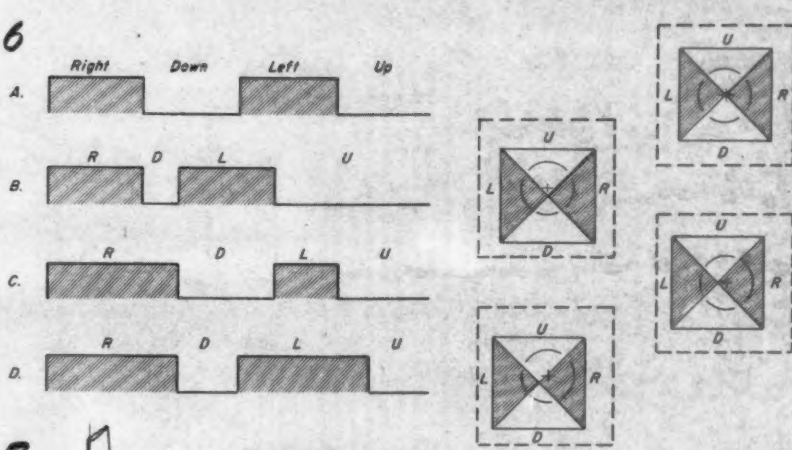
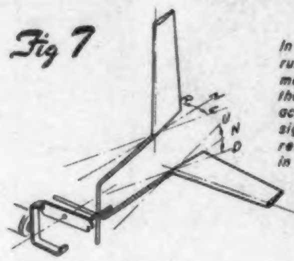


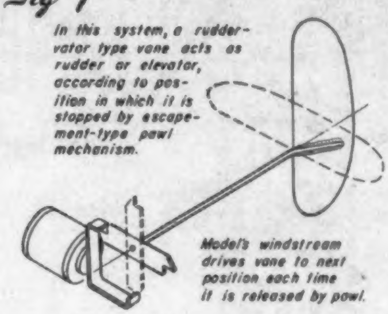
Fig 7



In this installation a rubber-powered escapement is used to drive the control linkages in accordance with pulsed signals from the receiver relay. System is shown in 'signal off' position.

Fig 9

In this system, a ruddervator type vane acts as rudder or elevator, according to position in which it is stopped by escapement-type pawl mechanism.



Model's windstream drives vane to next position each time it is released by pawl.

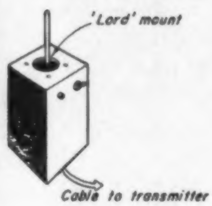
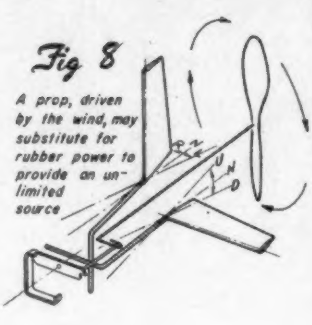


Fig 8

A prop, driven by the wind, may substitute for rubber power to provide an unlimited source



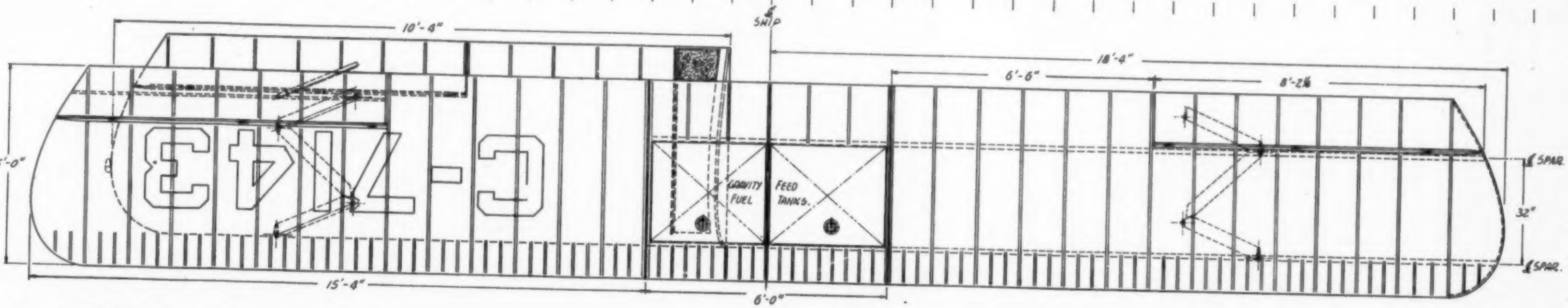
This article is not written with the intention of presenting to the reader a proven two control system. Rather, it is the purpose to challenge the reader's initiative and skill by outlining a theory for providing a two control system and presenting some practical applications of this theory which have had limited development. Due to the author's inability to devote sufficient time and experimentation to perfection, it has been suggested that publication would enable the problems to be solved by mass attack. The challenge to ingenuity is one that offers the reward of a control system which provides more control for the gadgetry involved than any other known.

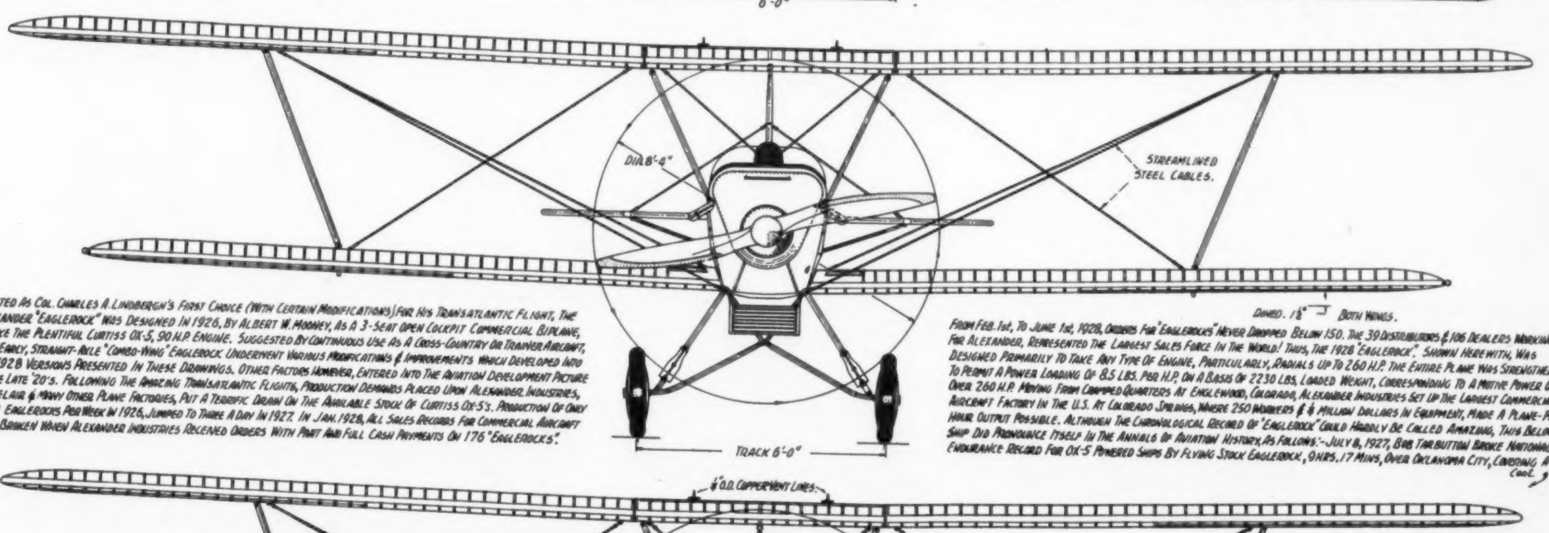
The principle involved may be understood by studying the basic waveform of the signals used to control an escapement. As shown in Fig. 1a, shape of the waveform is determined by the length of time a signal is on or off during one cycle of escapement operation. Assuming a rudder to be the device being controlled, the waveform is also considered in terms of control position and action of the escapement is shown in Fig. 1b.

For the particular waveform shown, in one second the sequence of signals is: signal on 1/4 second, signal off 1/4 second, signal on 1/4 second, signal off 1/4 second. Therefore, the escapement control arm pulses one complete revolution in one second and stays equally long at each of the four control positions. Thus, during any period of continuous pulsing, no effective control would result since equal right and left rudder positions would cancel each other, much in the manner of the pulser type magnetic actuator which has been used for proportional control systems (Trammel—June 47 MAN).

Because of this similarity, it may be visualized that proportional control may be obtained with an escapement if a means of varying the length of signal on periods is provided. For instance, a waveform as shown in Fig. 1c would result in an effective partial right control position because rudder was held longer on that side than the left. Likewise, by further varying this relative difference in control signals, effective control position may be changed so that more or less control is obtained. Fig. 1d shows the waveform for an almost full right effective control position. Full throw continuously is not possible during pulsing, since sequence must be fulfilled each cycle, but maximum effective control is, for all practical purposes, equal to fixed deflection.

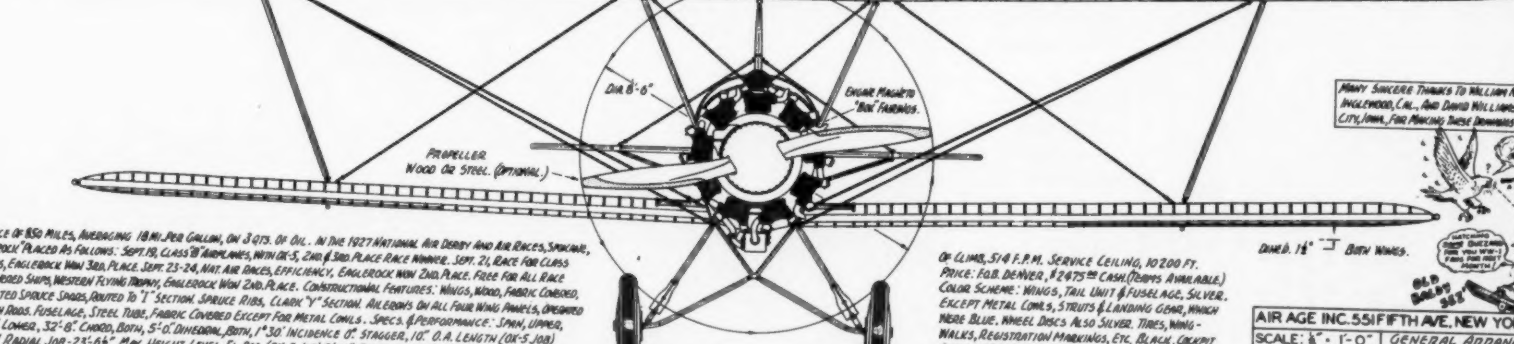
It should be noted that there is an important difference between the control signals necessary for proportional control when using an escapement than when a magnetic actuator is used. In the latter, control is obtained by varying the length of signal on period as compared with signal off period. But, with an escapement, due to (*Continued on page* 36)





REPUTED AS COL. CHARLES A. LINDBERGH'S FIRST CHOICE (WITH CERTAIN MODIFICATIONS) FOR HIS TRANSATLANTIC FLIGHT, THE ALEXANDER "EAGLEROCK" WAS DESIGNED IN 1926, BY ALBERT W. MOONEY, AS A 3-SEAT OPEN COCKPIT COMMERCIAL BIPLANE, TO TAKE THE PLENTIFUL CURTISS OX-5, 90 H.P. ENGINE. SUGGESTED BY CONTINUOUS USE AS A CROSS-COUNTRY OR TRAINER AIRCRAFT, THIS EARLY, STRAIGHT-AXLE "COMBO-WING" EAGLEROCK UNDERWENT VARIOUS MODIFICATIONS & IMPROVEMENTS WHICH DEVELOPED INTO THE 1928 VERSIONS PRESENTED IN THESE DRAWINGS. OTHER FACTORS HOWEVER, ENTERED INTO THE AVIATION DEVELOPMENT PICTURE OF THE LATE '20'S. FOLLOWING THE AMAZING TRANSATLANTIC FLIGHTS, PRODUCTION DEMANDS PLACED UPON ALEXANDER INDUSTRIES, TRAVELAIR & MANY OTHER PLANE FACTORIES, PUT A TERRIFIC DRAIN ON THE AVAILABLE STOCK OF CURTISS OX-5'S. PRODUCTION OF ONLY THREE EAGLEROCKS PER WEEK IN 1926, JUMPED TO THREE A DAY IN 1927. IN JAN. 1928, ALL SALES RECORDS FOR COMMERCIAL AIRCRAFT WERE BROKEN WHEN ALEXANDER INDUSTRIES RECEIVED ORDERS WITH PART AND FULL CASH PAYMENTS ON 176 "EAGLEROCKS".

FROM FEB. 1st, TO JUNE 1st, 1928, ORDERS FOR "EAGLEROCKS" NEVER DROPPED BELOW 150. THE 39 DISTRIBUTORS & 106 DEALERS WORKING FOR ALEXANDER, REPRESENTED THE LARGEST SALES FORCE IN THE WORLD! THUS, THE 1928 "EAGLEROCK", SHOWN HEREWITH, WAS DESIGNED PRIMARILY TO TAKE ANY TYPE OF ENGINE, PARTICULARLY, RADIALS UP TO 260 H.P. THE ENTIRE PLANE WAS STRENGTHENED TO PERMIT A POWER LOADING OF 8.5 LBS. PER H.P., ON A BASIS OF 2230 LBS. LOADED WEIGHT, CORRESPONDING TO A MOTIVE POWER OF OVER 260 H.P. MOVING FROM CRAMPED QUARTERS AT ENGLEWOOD, COLORADO, ALEXANDER INDUSTRIES SET UP THE LARGEST COMMERCIAL AIRCRAFT FACTORY IN THE U.S. AT COLORADO SPRINGS, WHERE 250 WORKERS & ½ MILLION DOLLARS IN EQUIPMENT, MADE A PLANE-PER-HOUR OUTPUT POSSIBLE. ALTHOUGH THE CHRONOLOGICAL RECORD OF "EAGLEROCK" COULD HARDLY BE CALLED AMAZING, THIS BELOVED SHIP DID PRONOUNCE ITSELF IN THE ANNALS OF AVIATION HISTORY, AS FOLLOWS:- JULY 8, 1927, BOB TARBUTTON BROKE NATIONAL ENDURANCE RECORD FOR OX-5 POWERED SHIPS BY FLYING STOCK EAGLEROCK, 9 HRS. 17 MINS, OVER OKLAHOMA CITY, COVERING A
CONT.



DISTANCE OF 850 MILES, AVERAGING 18 MI. PER GALLON, ON 3 QTS. OF OIL. IN THE 1927 NATIONAL AIR DERBY AND AIR RACES, SPOKANE, "EAGLEROCK" PLACED AS FOLLOWS: SEPT. 19, CLASS "B" AIRPLANES, WITH OX-5, 2ND. & 3RD. PLACE RACE WINNER. SEPT. 21, RACE FOR CLASS "B" SHIPS, EAGLEROCK WON 3RD. PLACE. SEPT. 23-24, NAT. AIR RACES, EFFICIENCY, EAGLEROCK WON 2ND. PLACE. FREE FOR ALL RACE LOW POWERED SHIPS, WESTERN FLYING TROPHY, EAGLEROCK WON 2ND. PLACE. CONSTRUCTIONAL FEATURES: WINGS, WOOD, FABRIC COVERED, LAMINATED SPRUCE SPARS, ROUTED TO "I" SECTION. SPRUCE RIBS, CLARK "Y" SECTION. AILERONS ON ALL FOUR WING PANELS, OPERATED BY PUSH RODS. FUSELAGE, STEEL TUBE, FABRIC COVERED EXCEPT FOR METAL COWLS. SPECS. & PERFORMANCE: SPAN, UPPER, 36'-8". LOWER, 32'-8". CHORD, BOTH, 5'-0". DIHEDRAL, BOTH, 1°30'. INCIDENCE 0°. STAGGER, 10". O.A. LENGTH (OX-5 JOB) 24'-11." RADIAL JOB - 23'-6½." MAX. HEIGHT, LEVEL FL. POS. (OX-5 JOB) 9'-11." RADIAL JOB, 10'-1½". GROSS WEIGHT, OX-5 2230 LBS. POWER LOADING, 24.78 LBS. PER H.P. MAXIMUM SPEED, 100.6 M.P.H. LANDING SPEED, 34 M.P.H. INITIAL RATE
CONT.

OF CLIMB, 514 F.P.M. SERVICE CEILING, 10200 FT. PRICE: F.O.B. DENVER, $2475.00 CASH. (TERMS AVAILABLE.) COLOR SCHEME: WINGS, TAIL UNIT & FUSELAGE, SILVER. EXCEPT METAL COWLS, STRUTS & LANDING GEAR, WHICH WERE BLUE. WHEEL DISCS ALSO SILVER. TIRES, WING-WALKS, REGISTRATION MARKINGS, ETC, BLACK. COCKPIT COAMING, BROWN LEATHER. PROPELLER, VARNISHED WOOD FOR OX-5, & WOOD OR STEEL, WHICH WAS OPTIONAL, IN RADIAL POWERED VERSION!

MANY SINCERE THANKS TO WILLIAM N. KEE, INGLEWOOD, CAL., AND DAVID WILLIAMS, IOWA CITY, IOWA, FOR MAKING THESE DRAWINGS POSSIBLE.

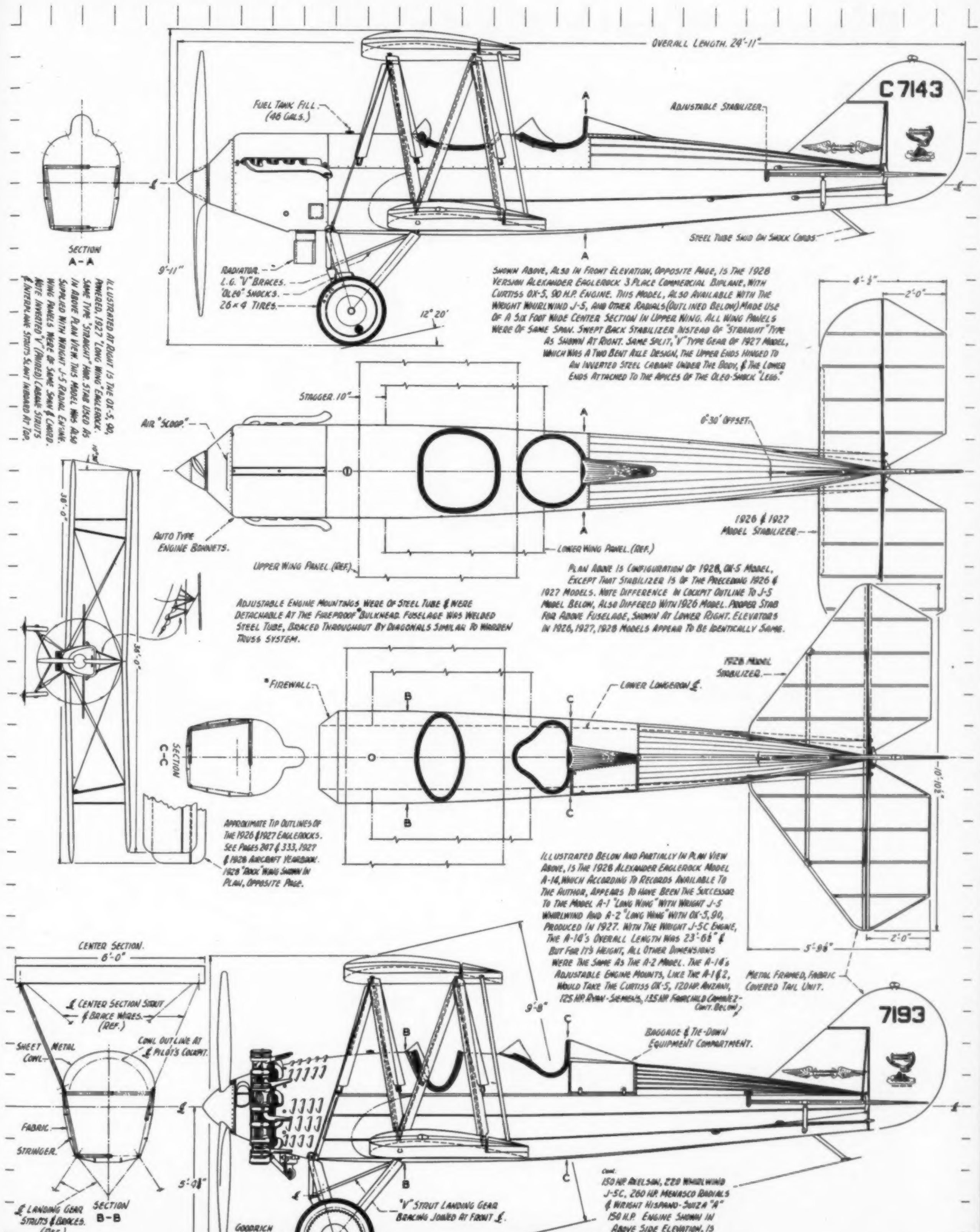
AIR AGE INC. 551 FIFTH AVE. NEW YORK, 17, N.Y.

SCALE: ¼" = 1'-0"

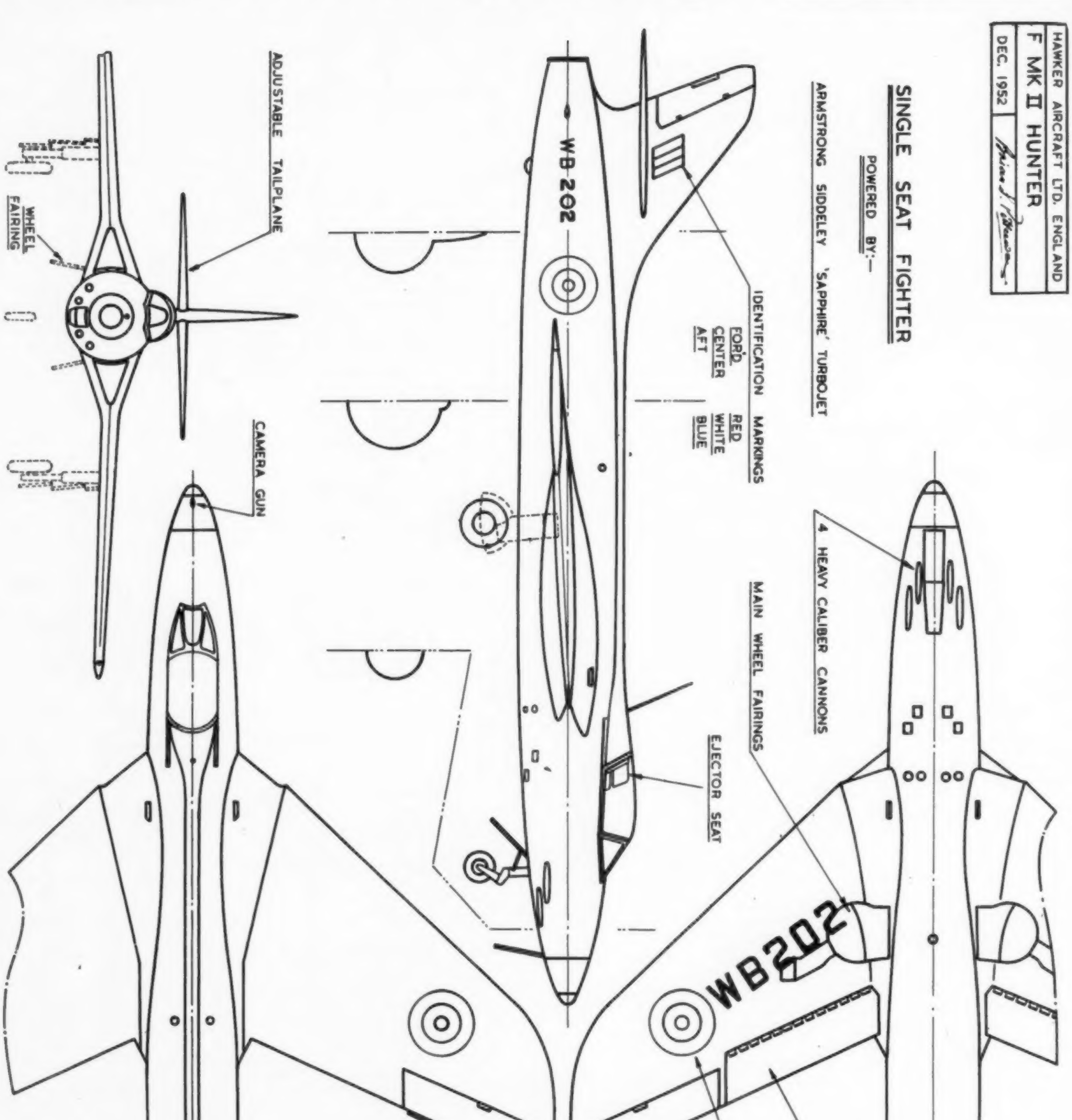
FULL SIZE: ¼" = 1'-0"

GENERAL ARRANGEMENTS. 1928 THREE PLACE COMMERCIAL

ALEXANDER EAGLEROCK


OVERALL LENGTH. 24'-11"
C 7143
FUEL TANK FILL. (46 GALS.)
ADJUSTABLE STABILIZER.
SECTION A-A
STEEL TUBE SKID ON SHOCK CORDS.
9'-11"
RADIATOR.
L.G. "V" BRACES.
"OLEO" SHOCKS.
26×4 TIRES.
12° 20'
SHOWN ABOVE, ALSO IN FRONT ELEVATION, OPPOSITE PAGE, IS THE 1928 VERSION ALEXANDER EAGLEROCK 3 PLACE COMMERCIAL BIPLANE, WITH CURTISS OX-5, 90 H.P. ENGINE. THIS MODEL, ALSO AVAILABLE WITH THE WRIGHT WHIRLWIND J-5, AND OTHER RADIALS (OUTLINED BELOW) MADE USE OF A SIX FOOT WIDE CENTER SECTION IN UPPER WING. ALL WING PANELS WERE OF SAME SPAN. SWEPT BACK STABILIZER INSTEAD OF "STRAIGHT" TYPE AS SHOWN AT RIGHT. SAME SPLIT, "V" TYPE GEAR OF 1927 MODEL, WHICH WAS A TWO BENT AXLE DESIGN, THE UPPER ENDS HINGED TO AN INVERTED STEEL CABANE UNDER THE BODY, & THE LOWER ENDS ATTACHED TO THE APICES OF THE OLEO-SHOCK "LEGS."
ILLUSTRATED AT RIGHT IS THE OX-5, 90, POWERED, 1927 "LONG WING" EAGLEROCK. SAME TYPE "STRAIGHT" HOR. STAB USED AS IN ABOVE PLAN VIEW. THIS MODEL WAS ALSO SUPPLIED WITH WRIGHT J-5 RADIAL ENGINE. WING PANELS WERE OF SAME SPAN & CHORD. NOTE INVERTED "V" (PAIRED) CABANE STRUTS & INTERPLANE STRUTS SLANT INBOARD AT TOP.
4'-½"
2'-0"
STAGGER 10"
AIR "SCOOP."
6°30' OFFSET.
10"
30'-0"
AUTO TYPE ENGINE BONNETS.
1926 & 1927 MODEL STABILIZER.
LOWER WING PANEL. (REF.)
UPPER WING PANEL. (REF.)
PLAN ABOVE IS CONFIGURATION OF 1928, OX-5 MODEL, EXCEPT THAT STABILIZER IS OF THE PRECEDING 1926 & 1927 MODELS. NOTE DIFFERENCE IN COCKPIT OUTLINE TO J-5 MODEL BELOW, ALSO DIFFERED WITH 1926 MODEL. PROPER STAB FOR ABOVE FUSELAGE, SHOWN AT LOWER RIGHT. ELEVATORS IN 1926, 1927, 1928 MODELS APPEAR TO BE IDENTICALLY SAME.
ADJUSTABLE ENGINE MOUNTINGS WERE OF STEEL TUBE & WERE DETACHABLE AT THE FIREPROOF* BULKHEAD. FUSELAGE WAS WELDED STEEL TUBE, BRACED THROUGHOUT BY DIAGONALS SIMILAR TO WARREN TRUSS SYSTEM.
36'-0"
1928 MODEL STABILIZER.
*FIREWALL.
LOWER LONGERON ℄.
SECTION C-C
10'-10½"
APPROXIMATE TIP OUTLINES OF THE 1926 & 1927 EAGLEROCKS. SEE PAGES 247 & 333, 1927 & 1928 AIRCRAFT YEARBOOK. 1928 "ROCK" WING SHOWN IN PLAN, OPPOSITE PAGE.
ILLUSTRATED BELOW AND PARTIALLY IN PLAN VIEW ABOVE, IS THE 1928 ALEXANDER EAGLEROCK MODEL A-14, WHICH ACCORDING TO RECORDS AVAILABLE TO THE AUTHOR, APPEARS TO HAVE BEEN THE SUCCESSOR TO THE MODEL A-1 "LONG WING" WITH WRIGHT J-5 WHIRLWIND AND A-2 "LONG WING" WITH OX-5, 90, PRODUCED IN 1927. WITH THE WRIGHT J-5C ENGINE, THE A-14'S OVERALL LENGTH WAS 23'-6½" & BUT FOR IT'S HEIGHT, ALL OTHER DIMENSIONS WERE THE SAME AS THE A-2 MODEL. THE A-14'S ADJUSTABLE ENGINE MOUNTS, LIKE THE A-1 & 2, WOULD TAKE THE CURTISS OX-5, 120 HP. ANZANI, 125 HP. RYAN-SIEMENS, 135 HP. FAIRCHILD CAMINEZ - CONT. BELOW.
5'-9⅛"
2'-0"
CENTER SECTION. 6'-0"
9'-8"
METAL FRAMED, FABRIC COVERED TAIL UNIT.
℄ CENTER SECTION STRUT & BRACE WIRES. (REF.)
7193
SHEET METAL COWL.
COWL OUTLINE AT ℄ PILOT'S COCKPIT.
BAGGAGE & TIE-DOWN EQUIPMENT COMPARTMENT.
FABRIC.
STRINGER.
5'-0⅛"
℄ LANDING GEAR STRUTS & BRACES. (REF.)
SECTION B-B
"V" STRUT LANDING GEAR BRACING JOINED AT FRONT ℄.
CONT.
150 HP. AXELSON, 220 WHIRLWIND J-5C, 260 HP. MENASCO RADIALS & WRIGHT HISPANO-SUIZA "A" 150 H.P. ENGINE SHOWN IN ABOVE SIDE ELEVATION, IS THE WRIGHT WHIRLWIND J-5C, OF 220 H.P. PASSENGERS SAT IN FRONT, SIDE BY SIDE, PILOT IN REAR. DUAL CONTROLS, BAGGAGE COMPARTMENT, FIRST AID KIT, COCKPIT COVERS, DEEPER SEATS. SHIP WAS WIRED FOR NIGHT FLYING.
GOODRICH SILVERTOWN 30×5 TIRES.
10'-1⅛"
13°

Planes Worth Modeling— THE HUNTER



For the R.C. Fan

(Continued from page 31)

sequence of operation involved, control must be obtained by varying the length of one signal on period, as compared with the next signal on period. Signal off positions in between are neutral and may be discounted for this case.

Obviously, a simple and positive method of obtaining desired control signals is a necessity if exact and effective control is to result. Any manual operation of a keying switch is impractical for this purpose, but the problem may be solved with a mechanical arrangement. Using a segmented disc, as shown in Fig. 2a, with dark areas insulated from light conducting areas, a wiper contact arm rotating along the dotted path would alternately make contact, then break, make again and break again, in each revolution or cycle. Thus, if the arrangement was connected into a transmitter keying circuit, it would alternately key transmitter on and off.

With the circular path of wiper centered on the disc equal pulses on and off would result, since each of the arcs across each segment would be equal. However, if either disc or wiper path is shifted to one side, there is a change in the length of control signals. As indicated in Fig. 2b, the arc of wiper contact is longer on the right than on left segment, while neutral signal off arcs are equal. Thus, the resulting waveform would be as in Fig. 1c, resulting in an effective partial right rudder position. Similarly, maximum effective rudder position may be obtained by a further shift, as shown in Fig. 2c, resulting in waveform shown in Fig. 1d.

Therefore, it may be seen that amount of effective rudder position obtained may be controlled by the amount of side shift of contact areas. With a simple direct linkage to a control stick, disc would move in accordance with stick position to obtain control signals which would automatically result in proportional rudder control position.

Not only is proportional rudder control obtainable in this manner, but proportional elevator may also be added with little additional complexity. In fact, elevator control is completely independent of rudder control, yet any combination of simultaneous rudder and elevator proportional control may be obtained as desired!

Consider the sequence of operation during a cycle which results when an elevator control linkage is added to the basic installation: As shown in Fig. 3a, starting with the first signal on position, with rudder right elevator is neutral. Signal off position then puts rudder in neutral and elevator down. The following signal on position restores elevator to neutral and puts rudder in left. Next signal on returns rudder to neutral and moves elevator up.

In waveform, sequence would be as shown in Fig. 4a. All signals are equal so that both rudder and elevator pulse equally to maintain effective neutral positions. As shown by Figs. 4b and 4c, by stretching or shrinking signal off pulses, only elevator position is changed. The left and right signal on positions are equal and cancel each other. The unequal signal off positions do not affect rudder since that control is in neutral during these signals. Similarly, by varying the length of signal on periods, rudder position only is affected.

By combining variations of signal on and off periods, simultaneous proportional control of both surfaces is achieved. As shown by waveform in Figs. 4d and 4e, so long as the sequence is fulfilled, any variation of signal on or off periods may be used. It is evident that any amount of either control may be obtained independently or simultaneously and all that is necessary is to provide for movement of the segmented disc in two directions instead of one.

Thus, by moving control stick to move disc forward or aft, elevator control is obtained; side to side movement obtains rudder control; diagonal movement obtains both controls. The amount of each control depends upon how far stick moves in each of the respective directions.

Basically, that's the system, but the details should also be considered. One of the most important questions to be asked is, "Does it fail safe?" Assuming the simplest failure, that of model going out of range or a transmitter malfunction, lack of a signal may be arranged to cause full throw rudder in either direction with neutral elevator. In this condition, model would be trimmed to circle tightly without spinning; a safe condition since model is then freeflighting without sailing off in a straight line.

To arrange this action it is necessary only to rotate escapement 90 degrees in relation to normal model installation so that signal on provides elevator control and signal off provides rudder control. Sufficient up elevator may be provided in its neutral position, by adjustment of linkage, to prevent a spin and yet full up or down positions are still completely effective for normal control.

With the best of mechanisms, an occasional missed or extra signal may sneak in to throw sequence out of synchronization. In this case, the orphan signal can be on or off but either way it can only throw synchronization off 180 degrees. In other words, left rudder becomes right and vice versa. Similarly, such an out of "synch" signal reverses elevator positions. Therefore, all that is necessary to restore synchronization is to turn the control box around 180 degrees in either direction to make control positions agree with stick positions. Another consideration involves complete failure of the control box so that no stick position is effective. In this case, it is only necessary to shut transmitter off to result in safe signal off model condition.

The first component to be developed was the transmitter control box. This is used to key the transmitter on and off and to vary the proportion of on to off interval in the manner discussed in the description of the theory. The control box is shown schematically in Fig. 5. The electric motor drives a wiper arm through a gearbox at the rate of about two revolutions per second. Motor is powered by two large flashlight cells and a rheostat is provided to adjust speed as desired and to compensate for battery run down. A switch is also provided.

The wiper arm makes contact with a segmented contact plate which is free to move in a plane perpendicular to wiper arm shaft. This plate is connected directly to control stick so that, when stick is moved, plate follows exactly. Note that plate does not rotate.

When stick is in neutral position, the center of contact plate is directly above wiper arm shaft so that, as arm rotates at a constant speed, transmitter circuit is opened and closed uniformly twice each revolution; that is, on for 1/2 second, off for 1/2 second, on for 1/2 second, and off again for a 1/2 second to complete one revolution. Fig. 6a shows diagrammatically the path traced by wiper arm on the contact plate and explains the keying action more clearly. As can be seen in this figure, the pulsed signal is a uniform on and off pattern so that neutral control results.

Movement of the stick in a direction to give up elevator control displaces contact plate from neutral position in manner shown in Fig. 6b. The sketch shows how the wiper arm traces a path on contact plate so that contact is made for a longer interval on up signal than on down signal during each revolution. Right and left signals are of equal intervals so that only elevator control is given. Note that elevator control signal is provided by off signal and rudder is produced by on signal so that, if transmitter or receiver fail, a rudder control position is given rather than an elevator position. Down elevator control is obtained by moving stick in opposite direction.

(Continued on page 38)

Movement of stick in a direction to give right control displaces contact plate from neutral position in manner shown in Fig. 6c. In this case, the right interval is greater than the left, but up and down intervals are the same so that only a rudder control is given.

To obtain a coordinated control of up elevator and right rudder, stick is moved to displace plate as shown in Fig. 6d. The corresponding signal pattern shows that in this case equal up and right intervals are produced which are much greater than left and down which are also equal. The ratio of elevator to rudder can be varied simply by moving stick either in the direction to produce more elevator control or in the direction to produce more rudder control. The motions of the control stick are exactly the same as those used in airplanes and very little practice is required to get the feel of the arrangement.

Some design notes accumulated in the course of experimentation are offered. The angular travel of the stick should be on the order of 40 to 60 degrees with a stick length of about 4". This should give about the right amount of feel to control stick movements. Radius of the wiper arm determines the size of the box that the control unit will fit in. The plate must be slightly larger than four times the wiper arm radius and travel must be limited in any direction to slightly less than twice the radius. This is specified to insure that the wiper arm does not drop off the edge of the plate and does not cross center of the plate. If plate travels too far, the wiper arm path falls all on one side of the plate and transmitter signals become unsynchronized. The contact plate should be supported in guides so that it moves freely with a minimum of slop or play in any direction and does not rotate when moved. The control stick should have no play and should be spring loaded so that it will return to neutral when released. This spring loading should provide increased pressure at the extremes of travel to provide feel to the movement.

In the experimental control box a 1/4" diameter dural rod was used for the control stick with a universal coupling connecting it to contact plate. Stick was mounted through a rubber Lord shock mount which acted as both a pivot and centering spring. The rod was pinned to the shock mount bushing to prevent rotation. A 2" x 2" plate was used with brass contacting segments and bakelite insulating segments. The plate moved on a shelf which served as a guide and also limited travel. The motor used was a Wilson 3-volt unit with a gear train selected from the various combinations that come with the motor. Two flashlight batteries in series provided an ample power supply to last several hours. The rheostat used had a range of 15 ohms and provided smooth control from very low speed to maximum. Complete unit was housed in a standard 3" x 4" x 5" case.

It is felt that this unit is satisfactory, but it is entirely possible that another arrangement may do the job just as well or better. In any case, it is essential that the mechanism be made as carefully as possible to insure consistent and reliable operation.

The remainder of our attention was devoted to studying and developing a suitable actuator to unscramble control signals and to move controls accordingly. It was taken for granted that receiver would require no modification, in order to make system adaptable to any equipment available.

The most simple readily available actuator considered was the commonly used self-neutralizing escapement. This unit was linked to rudder and elevator controls, as shown in Fig. 7, so that in the two positions corresponding to signal on, rudder was neutral with elevator deflected up or down and the two signal off positions the rudder was right or left with elevator neutral.

With this arrangement, as drive shaft rotates, rudder and elevator deflect in desired sequen-

tial order. In operation, drive shaft of the escapement rotates at exactly the same average speed as wiper arm shaft in the control box. However, the escapement shaft is constantly starting and stopping at each of the four control positions in a pulsing rotation.

One of the obvious drawbacks to this arrangement is the fact that an unusually long rubber motor would be required to drive the pulsing escapement throughout the duration of a flight. An early attempt to solve this problem used a motor to drive escapement in place of the rubber motor, but intermittent stalling at each of the control positions resulting in a high current drain which ran down batteries too quickly. A clutch arrangement on the motor to permit continuous rotation was tried but was found wanting due to wear and tear of constant clutching and declutching.

Another similar approach which wedded the rubber motor and the motor has been more satisfactory, although admittedly just a fair compromise. In this arrangement, motor was connected to one end of the rubber loop while escapement shaft was connected to the other. Thus, motor rotated continuously to keep the rubber motor wound as it turned the escapement shaft. An improvement on this arrangement would be the use of a torque switch which would run the motor only when rubber unwound. This arrangement would do the job, but we were not too happy about the added complication of a motor to a basically simple system, even though motor and the escapement together involved less than any other proportional two control system known.

It was recalled that a pulsing escapement, using a rubber drive, had been employed previously by E. Paul Johnson (July, '49, April '53), but installation required an extra long length of rubber to permit flight duration. Johnson's installation, however, seemed to be satisfactory and we estimate that a rubber length of about three feet might be adequate for flights up to ten minutes. This requirement would be suitable only for larger RC models, unless the use of gears, as are being used by Wakefield fliers, is resorted to in order to reduce overall length of installation.

A very simple and lightweight drive that has received some thought appears to offer a satisfactory solution; it uses a small propeller operated by the model's windstream much in the manner of a rudevator type control, as shown in Fig. 8. In such an installation, no rubber drive would be required. This idea is being tested and may be satisfactorily developed if no lagging or poor response is encountered in flight.

An existing unit which could be used without modification, although requiring a rubber drive, is the Rudevator. This unit offers good possibilities since its operation has been proven and no control surfaces or linkage are required, other than the rotating vane which is part of the Rudevator construction.

Another actuator which uses the Rudevator vane and the basic escapement unit offers the simplest solution of all. This actuator, shown in Fig. 9, consists of the vane attached directly to escapement drive shaft, which moves by force of airstream as permitted by pawl mechanism. The actuator weighs less than one ounce and requires no rubber or motor drive so that it is suitable for the smallest of radio control models. The disadvantage, which appears to be minor when compared with the advantages, is the non-scale appearance.

The future, if any, of the Pulsequence control system rests with you, and with us according to how much attention we can continue to devote to development. The theory is complete and practical experiments have been successful in indicating several approaches to perfection. Your ideas may make this control system practical and popular. END

World-Wide Engine Round-Up

(Continued from page 19)

Super-Tigre diesels. In those days these motors were manufactured by a firm called "OSAM" —*Officina Sperimentale Apparecchi & Motori.* Nowadays, this firm, located at Bologna, in Northern Italy, makes a different engine under the "OSAM" label and the present *Super-Tigre* models are built by *Micromeccanica Saturno,* under the direction of Signor Garofali, also at Bologna.

The present *Super-Tigre* range consists mainly of glowplug types, beautifully turned out and of high performance. They are the *G.20* of .15 cu. in. displacement, the *G.21* of .29 cu. in. and the .075 cu. in. *G.22* or *Baby Tiger.* The *G.20* is available in "sport" and "speed" versions, the main difference being the use of double ball-bearings and a higher (10 : 1) compression-ratio in the new *Speed* model. Our own *G.20 Speed* is of the latest type and we can vouch for its good design, fine construction and high output. This motor is supplied with three interchangeable venturi inserts, of varying choke diameter, for speed, free-flight or stunt work.

Bore and stroke are 15 x 14 mm. (.591 x .551 in.), a frequently used measurement for motors built to the very popular International Class I limit of 2.5 c.c. The motor weighs 4 oz. Construction features a pressure die-cast aluminum alloy crankcase and cylinder with a nickel-iron cylinder-liner. The front bearing housing and integral intake is likewise of pressure die-cast aluminum alloy. Both castings have a smooth, gray matt finish comparable in quality with that seen on some leading American engines, such as the Dooling 29. The piston is of the domed deflector type in heat treated aluminum alloy and has two compression rings. A forged aluminum alloy connecting-rod is used.

The *Supertigre G.21* is much the same in layout and construction to the *G.20* and has a bore and stroke of 19 x 17 mm. (.748 x .669 in.) giving a displacement of .294 cu. in. This engine is noteworthy for the exceptionally high output claimed of .8 b.h.p. at 17,500 rpm. We have not yet had the opportunity of conducting a personal test to check these figures but there is no doubt that the *G.21* is one of the most powerful .29's currently available in Europe. Like the *G.20-Speed,* it has twin ball-bearings, a lightweight ringed piston and interchangeable venturis are available.

The new *G.22 Baby Tiger* comes in a colorful display box, complete with wrench and plastic prop, just like a 1/2A, and is presumably aimed at the junior market. It has a bore and stroke of 12.5 x 10 mm. (.492 x .394 in.) and weighs 2 oz. 14,000 rpm are claimed with a prop of approximately 6.7 in. diameter by 3.15 in. pitch, for the diesel version. Unlike the bigger models a cylinder with integral machined fins is used which screws into the die-cast crankcase. A lapped steel piston is employed and the chrome-nickel-steel shaft runs in a bronze bearing. No wrist-pin is used, connection being by a ball-and-socket joint in the Arden tradition.

Current products of the other Italian firm we have mentioned, "OSAM" also favor glow ignition. The little *1700 Lilliput* model recently introduced is only 1.69 cc. (.103 cu. in.) but has two rings on a lightweight domed deflector piston and a ball bearing shaft. The piston, con-rod, wrist-pin assembly complete weighs less than one-eighth of one ounce. The bore and stroke are 14 x 11 mm (.551 x .433 in.) and a one-piece cylinder/crankcase casting is used with a shrunk-in steel liner. An international class engine, the *2500* model, is also turned out by "OSAM".

Also from Italy we have the *Penna,* made by *Lorenzo Penna* of Turin, a high-speed glowplug .60 which uses a ball-bearing shaft and ball-bearing disk-valve, and the *M.T.* series, produced by *Felice Mauri* and *Silvio Taberna* at Milan. These latter engines include the *M.T. 480,* a .29 for which .55 hp at 15,000 rpm are claimed, and the *M.T. 247* of .15 cu. in. displacement rated at .25 hp. Both are available either as glowplug or diesel motors.

In *France* a substantial share of the model engine market is held by *Moteurs Micron* of Paris who list no less than ten different models.

It was with a glowplug *Micron 60* that Gerard Laniot set an official absolute world record, in October 1951, of 231 kph (143.7 mph) and many other record performances have been achieved by *Micron* motors in Europe. The *60* is a straightforward disk-valve racing job, comparable in layout with the McCoy. The makers rate it at 1.0 hp at 12,000 rpm, but it is certain that a somewhat higher output can be reached. This motor has a bore and stroke of 24 x 22 mm. (.945 x .866 in.) which gives a stroke/bore ratio slightly lower than the McCoy *60,* although still well above that of the Dooling 61. (Both these American engines, incidentally, command great respect outside the U.S. and it is natural to use them as standards against which foreign engines can be assessed.) Construction features the one-piece crankcase and cylinder with integral by-pass and exhaust stacks and detachable front and rear covers, common to this type of motor. Unlike most, however, the glowplug (of *Micron* manufacture) is placed centrally in the deeply finned head.

As would be expected, the *Micron 29* follows the same general design, being again a disk-valve job using 180-degree porting and an aluminum two-ring piston. Only one (inner) ball bearing is used, however, and the color-anodised head has the plug offset to the *exhaust* side, rather than offset or inclined to the by-pass side as is more usual. Bore and stroke are 19 x 17 mm. and rated power 0.5 hp at 14,000 rpm.

The *60* and *29* comprise the *Micron* racing jobs for the F.A.I. classes II and III. In the same groups are the *Micron 10* and *28* which are aimed at the stunt and free-flight fields. These are shaft-valve engines using 360-degree porting. They use the same bore and stroke as the racing models but otherwise differ widely from them. The .60 cu. in. *Micron 10* is available either as a glowplug motor or with a timer for operation as a gasoline engine. The timer is fitted at the back of the crankcase on a large movable plate which allows manual advance and retard for speed control.

The 360-degree porting system used on these two French motors is not the same as the Arden system which has been so widely adopted outside the U.S. The exhaust consists of a ring of small circular ports and immediately below this is a flange which seals the top of a circumferential by-pass. The intake ports then consist of another ring of small circular holes below the flange. This same system was used on the British Yulon engines produced between 1948 and 1950 which were highly successful stunt engines and these two *Microns* have similarly enjoyed numerous stunt successes, including the French Aerobatic Championships. Whereas the Yulon was a lapped piston motor, however, the French engines used aluminum pistons with two rings. The glowplug *10* and the *28* weigh approximately 9 oz. and 6 oz. respectively and .3 hp and .6 hp are claimed at 9,000 rpm, although we would estimate these outputs would be reached at slightly higher speeds.

Apart from the 5 c.c. marine motor (a spark-ignition shaft-valve unit with thermo-syphon water-cooling) the remaining *Micron* models are diesels. The fixed head 5 c.c. (17 x 22 mm. bore and stroke) is, of course, an obsolescent design but still enjoys limited popularity for free-flight sport and R/C. The variable-compression *2.8* and *0.8* are also frankly old-fashioned today, both being 3-port models of moderate performance, although the *2.8* has

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more recently had its bore reduced to 15 mm. in order to bring it down to 2.47 c.c. for the F.A.I. 2.5 c.c. class.

Sole representative of the modern formula of light, high-speed diesels is the *Météore*. Made to the popular 2.5 c.c. class and having the widely used 15 x 14 mm. bore and stroke, this a shaft-valve radial-mount design, using 360-degree ports and giving an output of 1/5 hp or better for a weight of 4 oz.

Many French engines appeared during the first two years after the war. Among the few, in addition to *Micron*, which have remained are *Stab* and *Allouchery*. Both specialize in small diesels and are still advertising the same type of long-stroke, 3-port diesel which first brought them attention. *Jide*, on the other hand, departed completely from the tradition of their early .10 cu. in. diesel by announcing the *Jide-48* which was alleged to be the French equivalent of the McCoy and Hornet. It was a spark-ignition unit and based (as have been the majority of commercial model racing engines) on these two American designs. 1.25 bhp were claimed at 16,000 rpm, 29,500 with a flywheel and 13,500 with a prop at 25 cm. (9.84 in.) diameter and pitch.

Further north we find McCoy influence evident in the *Super-Typhoon* made by *Miniatuur-Motorenfabriek Typhoon* of Amsterdam. Again, the 24x22 mm. cylinder is used, giving 9.95 c.c. or .607 cu. in. The crankcase is sand-cast with a black crackle finish and uses a pressed-in steel liner. There are two models, the standard engine having one ball-bearing while the racing version has two. The former type is rated at .9 bhp at 15,000 rpm and the latter, 1.0 bhp at 17,500 rpm. Both run a compression of 9.5:1 and use lightweight pistons with two cast-iron rings.

A pair of disk-valve glowplug .29's are also made, known as the *Typhoon-IV*, the racing version again having twin ball bearings while the standard type has one. Again, a 19x17 mm. bore and stroke are used with a 9.5 compression ratio. Construction is similar to the bigger *Typhoon* except that a die-cast crankcase is employed. One-half horsepower at 14,000 rpm is claimed for the standard engine, while the racing version is rated at .55 bhp at 16,000, these rpm corresponding to the performance claimed on a 7x9 prop. This engine, incidentally, is reported to have propelled a speed job at 207 kph (128.6 mph) which is very good by European standards.

Also made by this Dutch firm is a 2.5 c.c. class engine, the *Typhoon-Diesel*, a shaft-valve, high-performance beam-mount motor with a form of 360-degree porting. In this, two bypass ducts on either side of the cylinder, between liner and casting, feed a circumferential chamber which, in turn suplies mixture to the combustion chamber via four equidistant ports below and between the exhaust ports. Owning one of these motors, we can vouch for the fact that it has a power/weight ratio which is among the best for diesels of up to 2.5 c.c.

Moving westward into *Germany*, we find many different makes of model motors but, at the moment, one, the *Webra* is virtually the only mass-produced model. Two *Webras* are being built, a 2.46 c.c. of 14x16 mm. (.551x.630 in.) bore and stroke, introduced early in 1951, and a 1.5 c.c. (.091 cu. in.) of 13x11.5 mm. bore and stroke, (.512x.453 in.) announced for 1953.

The construction of the *Webra 2.46* compares favorably with other European diesels of this popular displacement group and, from experience of our own *Webra*, it is easy to start, powerful and quite light in weight (3.6 oz.) The 1.5 c.c. model embodies a revised form of annular porting and is claimed to be the most powerful of its class. The *Webra* is built in the Western sector of Berlin .

Also from West Berlin, a new and extensive range has been announced during 1952 by

Berliner Werkstätten für Modellmechanik (BWM). Briefly, this includes the *BWM 50* (.03 cu. in.) diesel, the *100* (.06 cu. in.), *150* (.09 cu. in.) and *250* (.15 cu. in.) all of which are shaft-valve, radial ported types, the three latter models being available as diesels or glow-plug types. In addition, there are the *251*, a .15 cu. in. disk-valve, twin-ball-bearing diesel/glow-plug type, the *500*, a glowplug .29, and the *1001*, a .607 cu. in. twin-ball-bearing disk-valve glowplug job. The latter differs somewhat in construction from the usual run of racing .60's in that a combined front bearing housing and crankcase is used. The backplate is circular, secured by six screws, and the intake is positioned below the center-line on the right-hand side.

Built in the U. S. Zone is the *Metro 52*, another 2.47 c.c. (15x14 mm.) diesel with yet another variation of the 360-degree porting system. In this, drilled exhaust ports are used and the by-pass is through four inclined ports fed from an annular chamber between the lower part of the liner and the casting. Four slots are cut in the outside (threaded) part of the liner to form by-pass passages. A separate dural prop stud is used and the engine is of the shaft-valve type. An output of .22 hp is claimed, the complete unit weighs 4 oz.

Reliable information from behind the *Iron Curtain* on model engine production is as difficult to come by as anything else from those areas, but it does not seem that those countries have anything particularly interesting to show us. Czecho-Slovakia produced quite a good small diesel, the *Atom*, before the Communists came to power in that country, from which a subsequent development was the *Letmo*. The Russians, themselves, have produced spark-ignition, diesel and glowplug engines but such information as has been available is not such as to suggest any notable developments.

In the Russian Zone of Germany, however, the *Wilo* motors, engineered by *Willi Otto*, have shown up quite well. They consist of small diesels of .71 c.c. (.043 cu. in.), 1.36 c.c. (.083 cu. in.) 1.5 c.c. and 2.47 c.c. The later 2.47 c.c. and 1.5 c.c. models have *front* rotary disk valve, a feature which, so far as the writer can recall, has not been previously employed on a production motor, although it has been seen in amateur designs. Also in the Russian Zone, *Carl Zeiss*, world-famous optical instrument manufacturers, announced a .12 cu. in. diesel, the *Pioneer*, two or three years ago, but it was an out-of-date design even by standards of that time and nothing further has been heard of it.

In Vienna, *Herr Vitale* has brought out his *Vitus* diesel, Austria's first model aircraft motor, but, at this writing, production has not yet got under way.

The *Scandinavian* countries have, between them, produced a number of model motors—in small quantities as befits countries where the model movement is not very big but, nevertheless, including some interesting and well made examples. One of the best we have seen is the *David-Andersen*, built at Bestun, Oslo. It is a diesel, not making any special claims to ultra light weight or compact dimensions but exceptionally well made and finished. Production of this engine amounts to about 1000 per year and it is Norway's only production motor at the present time. The engine is designed for medium speed operation at which it can hold its own with any other of similar displacement and we found, in fact, from our dynamometer tests of the *David-Andersen* that, up to 9000 rpm it could equal or exceed the output of the best quantity-produced British engine of the same displacement.

The *David-Andersen* has a bore and stroke of 14x16 mm. It has a Meehanite cylinder with integral turned fins which are cadmium plated and polished and contrast pleasingly with the matt gray of the sand-blasted die-castings. It is shaft-valve motor but does not follow the

current fashion of circumferential porting, using, instead, twin exhaust ports and by-pass grooves front and rear.

Denmark is represented by three types: the *Viking, Thorning* and *Mikro*. Unable to secure examples for test, we obtained the services of a friend to test and report on the *Viking* and *Thorning* for us. The 2.47 c.c. *Viking* is produced by *Dansk Modelflyve Industri* at Odense. It is a long stroke diesel having dimensions of 12.7x19.5 mm. (.500x.768 in.) It does not have a great deal of power but was found to be easy to start and to be well made and finished. An unusual feature is the position of the single exhaust port which, for some reason, is in the front.

The *Thorning* is built in two models, a 2.5 c.c. which has the same bore and stroke as the *Viking*, and a 3.5 c.c. The 2.5 sells very cheaply for a European engine, the price being the equivalent of about $5.50. It has a shaft-valve and showed a higher output than the *Viking* but a less pleasing finish. It has a sand-cast crankcase with the shaft running in a cast-iron bush. A strange feature is the unbalanced shaft, the disk being cut away to clear the piston skirt at bottom-dead-center. This made the motor vibrate somewhat at speeds much above 6000 rpm. The 3.5 c.c. (.21 cu. in.) *Thorning* is a more modern design, using a short stroke, radial porting and claiming an output of .25 bhp.

The Danish *Mikro*, built by *Kai Nielsens* of Copenhagen, was one of the early post-war European types. More recently a hot looking glowplug .29 has come from this maker. This engine exhibits most of the standard racing .29 features, plus a big inclined carburetor intake at the back. It is rather heavy, however, scaling 300 grammes or 10-1/2 oz.

Before we leave Europe, mention must be made of an outstanding motor built just off the French coast in the island of Jersey. Although the Channel Islands are strictly part of the United Kingdom, they are in many ways, geographically and physically, more French than British, so we have an excuse for including their one and only model engine in this non-American, non-British review. This is the *Jensen C. I. Special*, a .60 cu. in. overhead-valve four-cycle gasoline engine. Actually, this motor was intended primarily for boat use, but one or two model plane enthusiasts have discovered its merits for R/C work. It is a beautifully engineered job and its design is actually based on full-scale motor-cycle engine practice. It has a genuine barrel type throttle control and a separate lubrication system. Developed power is .52 bhp at 10,000 rpm on straight gas and a compression-ratio of 6.5:1 which, however, can be raised to 13:1 and alcohol used, for racing purposes.

Since *Australia* has both a rapidly developing engineering industry and a growing model aircraft movement, it is not surprising to find that many motors have been built in that country. These engines include the *Hearn, Vampire, Gee-Bee* and *M. S.* The *Hearn-Tempest* and *Vampire-61* are racing 60's, while the M.S. is a 29 built by the Australian speed flyers Bill Marden and Harold Stevenson. It is very similar in appearance to the Dooling 29 except that sand-castings, heat treated, are used, while the S/B ratio is higher, bore and stroke being .780x.625 in. A moulded bakelite valve-rotor is used and the engine is claimed to turn up 17,000 rpm on a 7x10 speed prop.

Biggest production at the present time, however, is of the *Gee-Bee* engines designed by Gordon Burford, the most popular being the .15 cu. in. *Sabre 250* diesel, now to be augmented by the *Sabre 150*, a .09 cu. in. unit. We have examples of both these motors and have found them to be sound jobs, well thought out, nicely made and of good performance. The *250* gave approximately .22 b.h.p. at 12,000 rpm on test, started easily and ran smoothly. The *150* we have is one of two prototype units and may be bettered by subsequent production models. Even so, its performance was well up to standard.

Mention of the Atwood brings us to our last foreign motor, the Japanese-built *O.S. 29*, which Bill Atwood has lately introduced to the American market. We sampled one of these engines some time back and since one may be forgiven for supposing that an Oriental model airplane motor might be a copy of some successful American or European product, we will record that we were pleasantly surprised to find that, in the case of the *O.S.*, this is not so. It has, of course, certain features common to motors of other countries, but this is inevitable.

The *O.S. 29* is a businesslike-looking job with its deep finned aluminum head and big shaft-valve intake. The main casting is quite clean and has integral cast twin exhaust stacks. The .750 in. bore cylinder has turned fins, tapered in section, and the head is held down with four screws, only two of which pass through into the crankcase, fore and aft, to secure the cylinder. Porting is circumferential, the exhaust being ducted into the twin stacks and the intake being fed from twin by-pass passages. This porting system resembles that used in the Miles-designed E.D. 2.46, the only difference being that the latter has a full 360-degree by-pass.

A lapped piston is used with a slightly conical head. The shaft, 11 mm. diameter and running in a bronze bearing 42 mm. long, is counterbalanced. The *Sun* glowplug with which the test motor was fitted resembled the original fixed-element Arden plug. The motor is equipped with a light gage aluminum fuel tank anodized red and fitted to the rear cover with a single screw. Weight is only 7-1/4 oz.

Sure Flier

(Continued from page 25)

it lightly to fuselage. Now finish carving and sanding to conform to fuselage; when nose block has been finished to satisfaction it may be cemented firmly in place and given a first coat of sanding sealer.

Install landing gear and bind and cement in position. The rear hook-tail skid is now added; it is best to insert a two-ply lamination of hard 1/16" sheet balsa as a tail plug and pierce it to receive the hook. Add lower wing mount pins which are made from common straight pins. Bend and cement them firmly inside lower wing mount pieces. Sand fuselage and cover with Jap tissue or lightweight *Silkspan* of selected color. Water shrink paper and give two coats of thinned dope.

The stabilizer and rudder are built flat as shown in plans. Cover both sides with tissue; pin down to a small drawing board or other suitable surface and water shrink carefully to minimize warping. Give these parts one coat of thinned clear dope.

The wings are of equal span and are built in right and left panels. No separate center section is made. Set wing panels up at proper dihedral angle; pin and block firmly over plan and add center section leading edge, double spars and trailing edge pieces. With good cementing and joining technique a light, yet very strong, wing can be made in this manner.

Cut four small pieces of 1/16" diameter aluminum tubing; bind and cement in position on underside of leading and trailing edges of top wing. Align these wing mount receivers as carefully as possible.

Cover wings in sections for a wrinkle free job. Pin and block wings securely to minimize warping and water shrink tissue; give one coat of thinned clear dope.

The propeller shown in accompanying photos was finished from a 9" machine-cut prop blank and has proven very satisfactory. For an almost unbreakable prop, cover sanded and sealed blades completely with Jap tissue,

(Continued on page 46)

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and cover tips about 1-1/2" both sides with very fine silk and give several coats of thinned dope.

Various lightweight freewheeling devices may be used; the device shown here is very simple and always works. Insert and bend a piece of light wire in small section of aluminum tubing; bends are made at right angles to each other so top pin will be pressed against propeller to left when prop shaft engages lower pin of free wheeling unit.

The winding, hook-connecting pin part of the prop shaft is made first; then shaft is inserted through propeller and nose plug; complete motor hook after assembly of this unit.

Assembly of the model is very simple. Cement stabilizer in place; slip rudder in position and cement and align. Bend top wing mounts to sizes and shapes shown in plans. The front mount is 3/32" higher than rear mount, thus giving correct angle of incidence. Place these wing mounts on fuselage and hold in place with rubber bands looped around fuselage. Press wire mounts together and slip the ends into the aluminum tube receivers on the under side of the top wing; with but small adjustments of these wing mounts, secure and accurate alignment is possible.

The lower wing is held in place at zero incidence by slipping small rubber bands around front pins and stretching chord-wise under wing.

Details may be added as desired. The stars shown on model were cut from circles of light weight blue *Silkspan* and doped on wings to produce a white star on a blue field. A red center circle completed old-time insignia. Red and blue stripes were used on a white rudder to give old style rudder stripes.

The cockpit edges were doped black to give outline emphasis; the tires were doped black and wheel centers silver for added realism. The nose of this particular ship was painted copper to give color harmony with brown fuselage.

Your completed model should weigh approximately 1.5 oz., an eight strand motor of 1/8" flat T-56 rubber will give a flying weight of about two ounces. Make an "S" hook as shown and attach to motor. It is advisable to secure motor to both prop shaft hook and "S" hook with small rubber bands to insure a true running motor. A vibration free motor run will give improved performance. Lubricate rubber thoroughly before test flying.

Adjust thrust angle and wings to give a right climb and glide. The model will turn in flights of 40 seconds hand-wound under cold air, no wind conditions. Times up to 1 min., 50 sec. hand-wound were logged in warm air before prototype was lost high in a gum tree at 1 min. 10 sec. as it sailed serenely along in a thermal.

Heinrick "Victor" Scout

(Continued from page 16)

gussets at all strut joints. Make strut fillets from clear dope and talcum mixture.

Make 1/16" x 1-9/16" x 2" plywood gear mount. Bevel edges to fair into fuselage. Bend up .040 alum. alloy 24 ST gear and attach to plywood with four 2-56 machine screws and nuts. Cement plywood to fuselage and wing bottom. Add balsa filler to fair in fuselage.

Sand entire plane with #400 paper. Apply Testors sanding sealer with brush two coats at a time, until grain is filled. Sand with #400 between each two coats. Struts are clear doped and left natural. Brush on four coats yellow STA dope, sanding between coats with #400 paper. Paint red, white and blue rudder strips using STA. Paint cowl, spinner and wheel centers red. Gun barrel is black and gun stock silver. Add 3" star decals, windshield, cockpit coaming.

The scout balances 2-1/4" back of top wing L.E. Add weight to balance. Fly on 25 foot lines. Let ship roll. Give slight up elevator at start and takeoff when sufficient speed is attained. END

The 1954 Wakefield Model

(Continued from page 21)

extent, efficient indoor stick practice. But it is questionable whether this is worthwhile. Such a layout could probably be produced at a lighter airframe weight, but now we have to make the airframe weigh *more* than five ounces. About the only advantage given by shorter geared motors would be a reduction in inertia effect of motors and possibly a more stable model.

A design for a 1954 Wakefield was sketched out utilizing a 38" motor taut between hooks. The main reason for deciding on a taut motor was that experience and tests have shown taut motors eliminate bunching and produce a smoother power run. There is no question of getting more power out of a taut motor. For a given amount of rubber you can only get the same amount of power, however you use it, provided you use it as efficiently as you can each time. This is borne out by a number of practical tests carried out with Wakefields using same weight of rubber made up into motors of different cross sections. Provided you adjust propeller pitch to give a similar efficiency in each case, still air duration works out about the same. With the *same* motor, and this time adjusting pitch of propeller to give a range of trim from a short power run, high climb, to long power run, low climb, again still air durations work out much the same.

However, as your editor pointed out, developing a new design which was essentially different from those I normally fly might well produce a few bugs which would require eliminating before design was foolproof. Time, too, was running short and the design project was reconsidered around my 1952 layout which was, that year, a new design which proved particularly successful. It used two 31-1/2" return gear motors equivalent in cross section to about 12-3/4 strands of 1/4" rubber, with a total motor weight of four ounces. Still air duration was in excess of 4 min. 40 sec. and design had an overall average for the 1952 contest season of four minutes (including several o.o.s flights of less than a possible maximum).

With a hook distance of 31-1/2" available it did not seem worthwhile to stretch fuselage to give an extra 1-1/2" to accommodate a taut 16 strand motor. A 14 strand motor could be accommodated very easily with a minimum of cording turns and since slack involved was a mere 6-1/2", bunching troubles were highly unlikely. Corded motors are generally trouble-free until normal motor length exceeds 1.5 times hook distance. One of the 1952 models was accordingly tried out on such a 2.8 ounce single skein motor, with model ballasted to bring it up to required minimum total weight, and proved to retain all the desirable characteristics of original except duration of power run.

Other factors concerned with getting the best out of the new formula were also favorable to the 1952 layout. On the face of it, getting optimum performance from a limited amount of rubber would appear to favor full streamlining of the model and marked attention to aerodynamic design. Previous experience with Wakefields has shown that aerodynamics of the model are of little significance compared with rubber weight. In other words, the possible gain from aerodynamic refinements was negligible compared with potential gain from, say, an increase in power-weight ratio by boosting rubber weight and decreasing airframe weight to keep the same total weight. With limited rubber weight, aerodynamic considerations become more important.

There is still little evidence to support the supposition that full streamlining will produce a better Wakefield. The opportunities are there now, for it is comparatively easy to build an airframe of Wakefield size at five ounces total weight. But it is doubtful if wings will be more efficient, if at all, if made with elliptic planforms and, in terms of drag values, a "clean" slabsider should still be directly comparable

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STATION	%	0	5	10	20	30	40	50	60	70	80	90	100
	IN.	0	.32	.64	1.27	1.91	2.99	3.19	3.52	4.46	5.10	5.74	6.375
UPPER	IN.	.137	.38	.50	.63	.66	.69	.59	.51	.41	.30	.165	0
LOWER	IN.	.137	.04	0	.04	.09	.10	.10	.09	.07	.055	.03	0

ORDINATES—TIP SECTION TEMPLATE RIB & TIP RIB (SAME ORDINATES FOR DIFFERENT CHORD LENGTHS)

STATION	%	0	5	10	20	30	40	50	60	70	80	90	100
	IN.	0	.225	.45	.90	1.35	1.8	2.75	2.7	3.19	3.6	4.05	4.5
UPPER	IN.	.09	.29	.33	.42	.445	.43	.39	.34	.27	.20	.11	0
LOWER	IN.	.09	.03	0	.03	.06	.066	.066	.06	.098	.036	.02	0
TIP RIB STATIONS	IN.	0	.20	.39	.78	1.17	1.56	1.95	2.34	2.79	3.12	3.91	3.9

with a "streamliner".

Articles on drag have mentioned all possible means of increasing efficiency, with particular emphasis on cutting down wetted area. However, probably the best method of considering relative efficiency of a design is in terms of head resistance. That is, viewed from the front, model should present a "clean" appearance with no abrupt changes in section. Here the square (or diamond) fuselage with no built-up cabin or pylon shows up as well as any design. Mounting wing high is a necessity with an aft center of gravity position, but this is a trim I have never favored. Theoretically, there are advantages to be gained by balancing model towards trailing edge of the wing and making stabilizer carry part of the load, but the model rigged with center of gravity farther forward is generally safer.

Far more important than sheer aerodynamic efficiency is the requirement that design should be stable under all conditions likely to be met, and with a sufficient reserve of stability to make it relatively non-critical. Couple this with rigidity in the sense that the components are warp-resistant and positively located and then, if you want, worry about aerodynamic refinements.

These considerations, then, will probably set the standard for "restricted rubber" Wakefield designs—the geared model and long fuselage layout eliminated and designs reverting to more or less orthodox. We can now build stronger, and therefore more rigid structures, which should make for more consistent flying, although average performance is bound to drop. Still air performance is closely related to rubber weight, and 2.8 ounces of rubber, used efficiently, would appear to make 3-1/2 min. still air time a first class performance.

If you have the right prop for the motor, a short, fast climb with, say, a 16 strand motor, a moderate climb with a 14 strand motor or a possible 100 sec. power run with a 12 strand motor should all give similar still air times. For flying under all conditions, however, we want a good climb (for rough weather) and a long motor run (to prolong duration in poor or "downdraft" conditions). With rubber limited we can only compromise by using moderate power (14 strands) and then trying to find the most efficient prop possible for the design.

Having finalized the project around my 1952 design, various improvements were studied. Structurally, the original model left little to be desired, with geodetic wings, fin and stabilizer giving positive anti-warp characteristics. Overall strength was more than adequate at original structure weight of four ounces and it was not thought desirable to boost this by increasing wood sizes throughout. Rather, hard stock can be used and model brought up to weight by ballasting, locating this ballast near center of gravity. This is better than distributing extra weight throughout airframe. About the only change is a slight increase in aspect ratio to increase wing span since, in spite of the restricted rubber, it was decided to increase propeller diameter.

The only way in which we can get more out of a rubber motor is by increasing propeller efficiency. Here, it seems, the large diameter props introduced by 1952 U. S. Wakefields show a marked improvement over the hitherto standard 18" diameter. Bearing in mind that we are limited to a 2.8 ounce motor, 20" diameter seems about as far as we can go in this direction, for a start at least, under new rules.

A 20" diameter prop is too big to freewheel without spoiling glide, especially as pitch will have to be lowered and glide performance is very important with a limited power run. A folding prop was considered, and rejected because it was felt that to use power most efficiently to the last turn transition from power run to glide must be accomplished without any trim change. Hence the adoption of a feathering propeller and a consequent increase in fin area over original design to compensate for "forward fin" effect of the slowly rotating propeller on the glide.

Time has not permitted enough tests to assess the performance of this new Wakefield fully. However, still air duration appears in the region of 3 min. 30 secs. to 3 min. 40 secs. with climb, if anything, an improvement on the '52 model, but limited to a power run of about 85 sec. This is accomplished with propeller set at about 27" pitch. Increasing pitch increases power run but kills initial climb. Decreasing pitch cuts power run below what is considered a safe figure for consistent results under varying conditions.

Structurally the model incorporates a number of unusual features. The fuselage is built with diagonal longerons, first constructing a jig from 1/16" sheet, taping longerons in jig with cellulose tape and then cementing in spacers and diagonal braces. One section of the jig is removed to withdraw completed

(Continued on page 50)

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fuselage. A fully geodetic fuselage could be built (easy in this form of jig), if preferred.

Build stabilizer before wings to get used to the method of assembling geodetic ribs. Ribs can be half-jointed where they cross, or one half of the full number of ribs laid down and remainer cut in half and butt-jointed in place. Ribs are laid down over the bottom 1/5"x 1/32" spar web, 1/32" strip webs added and top 1/5"x1/32" spar web cemented in place.

Cut two sets of wing ribs for each wing panel, using 'template' ribs shown. Ten ribs are required for each set (i.e., 20 ribs in all in two identical sets). Lay down one set of ribs diagonally, then add other (crossing) ribs, butt-jointing or half-jointing again. Also cement in root and tip ribs, using template to set root rib at required angle. Spar notches are cut in root and tip ribs before assembly. With a straight edge, now mark and file spar slots in all other ribs. Add spar, sinking top 1/32" below level of ribs; trim front part of the ribs and cement on sheet covering.

Hardwood locating dowels are cemented into root rib at right angles, after first facing this rib with 1 mm ply. Reinforce trailing edge with a scrap piece of balsa, subsequently carved and sanded down to a smooth, rounded fillet. Strut fix is 24 s.w.g. wire, locked in a piece of 1/20" celluloid and cemented to spar with an added filler piece of 1/16" sheet between appropriate ribs. Cap root rib with a strip of 3/16"x1/32" balsa and then sand whole panel down prior to covering.

Wings locate on fuselage sides by means of stub dowels plugging into holes in ply facings. The two wings are lashed together at center with a small rubber band and fitted with wire struts plugging into a short tube bound to bottom longeron of fuselage. This method of fitting is foolproof, allowing wings to flex downwards without damage if model turns over onto its back, or knock off fuselage in a crash landing. Wings are exceptionally rigid in an upward direction.

Propeller blades are carved from 1/2" sheet and fitted with fibre tube shanks. These are a sliding fit in a dural tube hub (wall thickness approximately 1/32") and are locked in hub by means of a short length of 20 s.w.g. wire protruding through slots cut in hub. Front of this wire is engaged by crosspiece soldered to propeller shaft and blades rotated to correct 27" pitch position (determined by length of slots in hub) by torque of motor. Propeller releases and starts to freewheel when motor runs out, sliding back along shaft against backing washer soldered to shaft. On release a rubber band pulls each blade into its feathered position. When feathered prop should have sufficient pitch to continue to rotate very slowly (about two seconds per revolution).

Propeller shaft is terminated in a 'S' hook. Rear of motor is looped over a bobbin and fitted with an anti-bunch device. Rear peg is a length of dural tube located vertically in fuselage between two 1/16" ply keys. Rear peg is completely enclosed and motor, fitted to rear peg, is loaded into model via access door.

Down and sidethrust settings shown on plan should be correct. When model is completed and fitted with a 2.8 ounce motor, find excess weight required to bring total weight up to 230 grammes (8.113 ounces). Use ballast to this weight in front and rear ballast boxes (paper tubes), using disposition of this weight for fine trimming. Otherwise trim by adjusting stabilizer incidence.

Correct glide turn is established by packing up righthand side of tailplane. If power turn requires some trimming out, do not increase sidethrust but fit a trim tab to fin, as shown, and offset this to adjust turn. This tab will be almost completely ineffective on glide (i.e., this tab controls power turn, not glide turn).

Supermarine 508

(Continued from page 11)

to plan, followed by lower 1/8" sq. spar and lower 1/16" sheeting at root ribs. Now add ribs A-F, upper 1/8" sq. spar, upper 1/16" sheet L.E. and T.E. pieces—in that order. Check tilt of root rib against angle template Y and add 1/16" sheeting over space between ribs A and B. When dry, remove panel from plan, shape L.E., T.E. tip to correct sections.

Repeat process for other stabilizer panel, then pin one panel to plan and join other panel to it, checking dihedral angle with template Z. Place greaseproof paper over underside of stabilizer joint and after chamfering inside edges of 1/16" sheet platform pieces, cement latter together, holding in position with pins.

The fuselage is built flat on plan in upper and lower halves, the basic profile portions being made by sandwiching a 1/4" thick sheet

and strip core between 3/16" sheet sides. The nose profile extends to former B and tail profile starts just rear of former F, the two being bridged by upper and lower strips of 1/4"x 3/16". The profile portions are then completed by addition of planked shells.

Start *lower* profile by pinning 3/16" sides to plan. Next cement 1/4" sheet core in position at nose and add vertical pieces of 1/2" x1/4" and strips of 1/4"x3/16". When dry, cement other 3/16" sides in position. This procedure is shown in three stages in accompanying sketch (Fig. 1). After removing from plan, *upper* profile is built in a similar manner, except that 1/4" sheet (T) is used instead of strip at extreme tail in this case. Round off vertical edges of profiles in front of and behind engine.

Next pin lower profile in an upright position (checking with square) over plan. Pin wing tongue to plan and dab-cement assembly formers A-G in position. Now plank with 1/4"x 1/8" strips, starting with ones adjoining plan (notching these to take wing tongue). Note that planking is NOT cemented to formers B-F, only to formers A and G. Hold planking in position with modelling pins and push these well home to ensure that strips fit tightly against formers. As planking progresses, be sure to remove any inside pins that might prevent shell from being lifted from plan.

When quite dry, remove lower shell from plan and carefully pry off wing tongue, after first marking location of fuselage sides so that tongue can be re-cemented back in exactly same position later. Pull out all but formers A and G—then pin them back in position, after giving inside of shell four coats of clear dope and one of proofer. Screw and cement 5/16" sq. hardwood bearers to underside of tongue, insert engine bolts and solder strip of wire across each pair of heads to secure them.

Slide 1/8" sheet reinforcing pieces over tongue ends and re-cement tongue to lower fuselage shell, carefully checking alignment. Solder tin straps to a small tank of a size sufficient to give about 30-40 sec. engine run and fasten to tongue with wood screws. Bolt engine in position.

Build upper fuselage shell in a similar manner, pull out formers (except for A and G) and pin them back in position after doping and fuel proofing. Now cement shell and profile halves together, using slow drying cement and binding with flat rubber to hold in place until quite dry. Gently sand planking quite smooth, then slide 1A ribs over projecting tongues. Add wing panels, dab-cementing them to the 1A ribs. Measure distance from wingtips to extreme end of fuselage to ensure correct top view line up. Fill in spaces between 1A ribs and fuselage sides with scrap strip and sheet. When dry, cut wing panels free.

Measure hatch location from plan, mark on planking and stretch pieces of thread round fuselage to provide accurate cutting guide lines. Cut hatch free with a new razor blade and hinge with tape on edge shown. Unpin and remove all assembly formers (A-G) at this stage. Cement 1/4" wide strips of celluloid to inside edges of fuselage to provide a seating for the hatch.

The simplest way of keeping hatch closed is to have a rubber band encircling fuselage just forward of the hatch—band being slid back after closing hatch. However, we recommend a simple fastener of the type fitted to prototype. This consists of a rubber band loaded catch which passes through tubing set in one wing root.

Take out engine (using a box spanner to remove securing nuts) and add neoprene filling extension and vertical 1/8" ply strut. The latter prevents wing tongue flexing and fan causing possible damage to fuselage shell. Mark out fan in pencil on 1/16" aluminum (NOT dural), drill six holes and cut out with a scroll or coping saw. Bend blades to about

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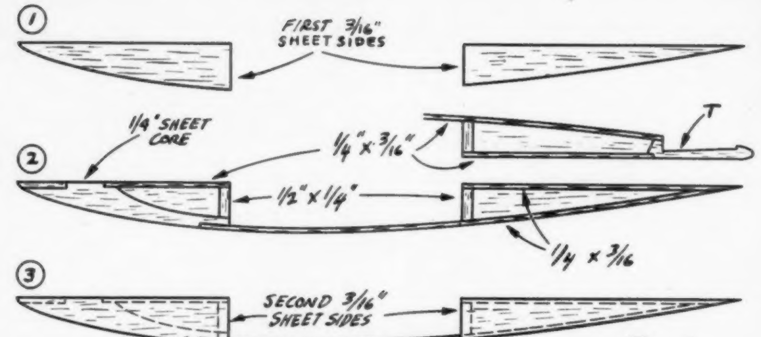


FIG. 1

20°-25° and concentrate on obtaining an 1/8" hollow behind blades. Drill a hole in a 1-1/4" or 1-1/2" bottle cap and bolt this to motor behind fan. Make an extension to needle valve, so that adjustments can be made in comfort from outside fuselage.

Only small details now remain before model is ready for covering. Cement stabilizer platform to fuselage tail, carefully checking head-on and top view alignment. When dry, place detachable stabilizer in position, cement 3/32" sheet sub-former to it and build up stabilizer fairing from soft block or sheet. Drill a hole in fuselage (in line with stab. L.E.) to take a piece of 1/8" inside dia. aluminum tubing. Round off edges of nose and tail profiles and sand entire model smooth.

Covering is simplified by detachable flying surfaces. Use lightweight *Silkspan* and cover wing panels and stabilizer in usual way, undersides first. Tighten covering by spraying with water. The structure of these components resists warps, but it's a good scheme to pin parts down anyway, while dope is drying. Brush on four coats of clear dope for wings and three for stabilizer. Completely cover fuselage with *Silkspan* as well (using dope as adhesive) and give four coats of clear dope. Paint on canopy (black) and R.A.F. roundels. Finally, give entire model a coat of transparent fuel proofer.

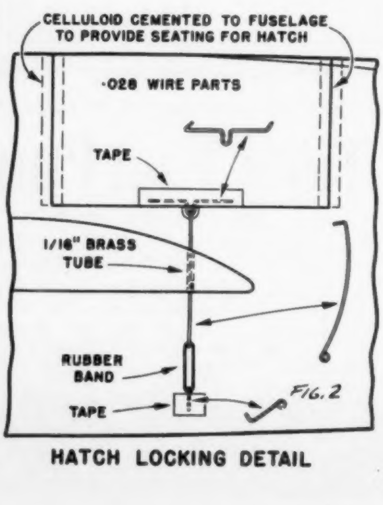
Cement celluloid trim tabs to stabilizing panels and port wingtip. Retain stabilizer by a rubber band looped through aluminum tube and over fuselage end. If tongues are loose in wing boxes, dope former several times until good fittings result. The nose and underside of fuselage may be protected from rough ground landings by cementing a skid of .028 wire in position.

Weight nose of model in slot provided, with lead shot or old cement tubes (about 1-1/4 ozs.) to obtain correct balance (see plan). The best practical way of doing this is to push a pin in fuselage top, in line with balance point, and hold over a table top, adding or taking off weight until model balances level. Fill in hole in nose with hard scrap balsa.

Before running engine in model, mount on a test rig (with a similar tank installation) and get used to exact starting and running settings. Turn over fan slowly and check that blades are equally angled and in line with each other. Originally, we used Tom Purcell's bottle cap/friction tape method of starting, but later modified hatch to allow engine to be flick-started. Still, the bottle cap method is preferable, since larger hatch must weaken fuselage slightly. Get into habit of making a check for any cracks at blade roots of fan after each run, since a sheared blade at 14,000—15,000 rpm could do a lot of damage.

Test glide from high ground to enable model to settle into its "natural gliding speed"—adjusting stabilizer tabs to correct any stalling or diving tendencies. If very large tab adjustments are needed, vary nose weight. When satisfied with glide, obtain a *gentle* left turn, by means of wing tab. Start up engine, adjust for maximum revs, fasten hatch and then launch on a level keel.

We found that torque effect tightens up left turn only slightly and we suggest you use this left/left trim for best results. The *508* gains altitude in lazy spirals and shows no tendency to stall under power. Since wing loading is fairly high, model is immune to most thermals and you can safely allow engine runs of 30 sec. or more. But if your local risers are really strong, better fit a tip-up dethermalizer just in case. Vary blade angles of fan between flights until best performance is obtained.



HATCH LOCKING DETAIL

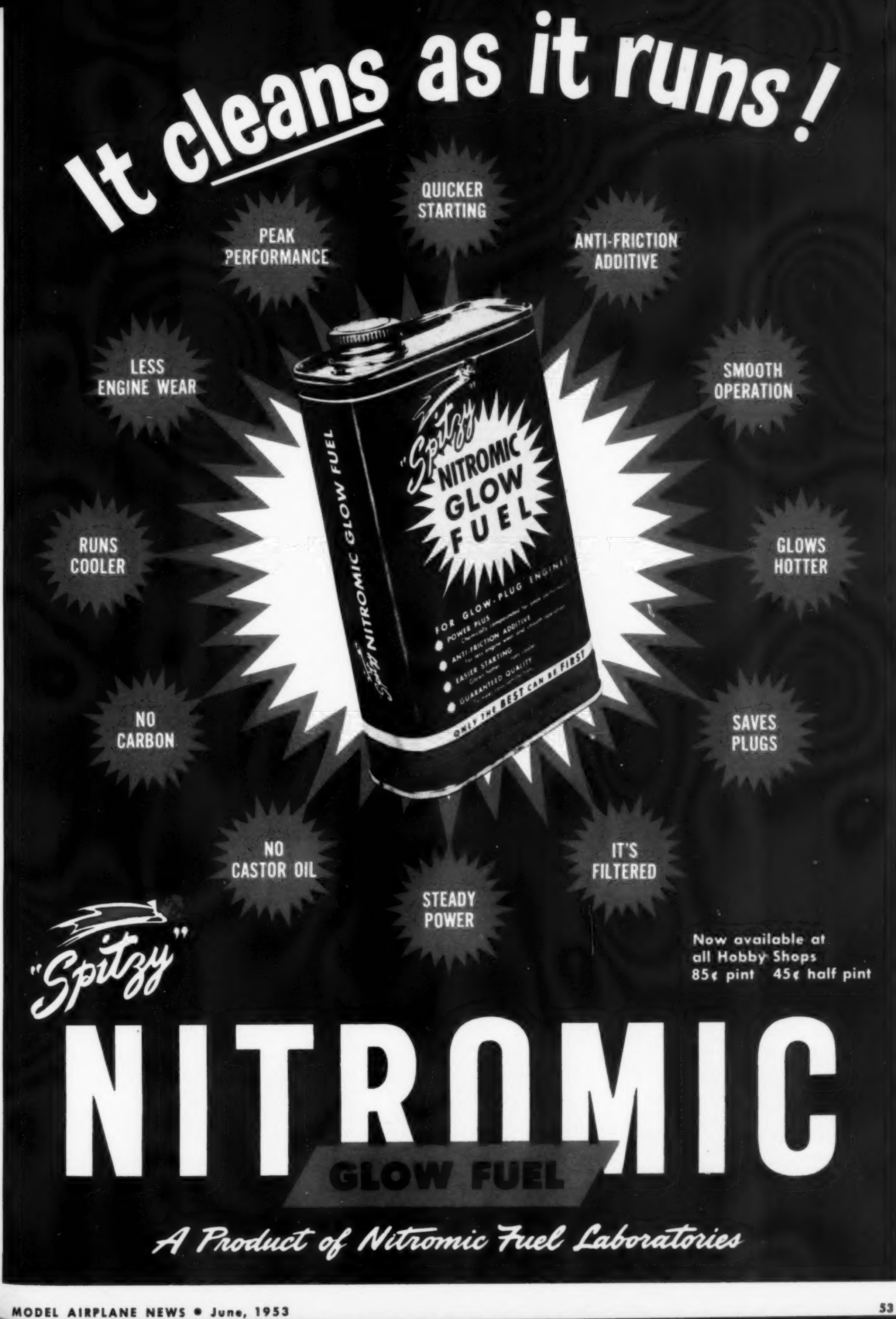
Engine Review

(Continued from page 20)

gives early opening and early closing without the degree of overlap featured in racing engines. This means that, regardless of rpm, there is no tendency to blowback as in the case of later timing. This is a great aid to setting the needle valve prior to launching; suction remains fairly constant in relation to engine speed at all times so that needle can be set near maximum revs on the ground. Fuel feed will remain satisfactory at increased revs developed in flight and also just when you need it during the reduced speed in a tight maneuver. With racing timing, however, there is a tendency to suck the mixture in and then blow some of it out again at low revs, making it necessary to set needle rich on the ground so that it will lean out to the best mixture at speed in the air. Thus, in a tight maneuver, when the racing engine slows down, mixture may go haywire giving a power sag which every stunt flier has experienced.

The next factor which regulates suction is the cross sectional area of intake at the point where jet is located. This, in conjunction with displacement of the engine, governs the velocity at which air passes over spraybar, and in turn determines amount of turbulence created underneath the spraybar where, in the Fox, jet

(Continued on page 54)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is located. It is this turbulence or area of low pressure which actually sucks fuel from the tank. It is a useful tip to bear in mind that, for maximum suction in any engine fitted with a spraybar, the best location for the jet hole is on the underside. You can vary this suction as desired simply by rotating the spraybar. Incidentally, a very common source of erratic running is an air leak where the flexible fuel line is hooked up to the engine and also the tank, since it is a source of trouble that can easily be eliminated when there are so many other complex bugs to deal with in engine operation, it is a good idea to make sure of these connections by binding them with wire. Pinhole vents are another fallacy. Air has to go into the tank to let fuel out. The easier it can get in the better. It pays to keep tank vents on the generous side to avoid blocking.

The third contributing factor towards effective carburation in the Fox is location of the jet in the closest possible proximity with crankshaft port. This means that almost as soon as the rotary valve begins to open fuel laden air will enter. In engines, large and small, which employ any length of plumbing between jets and inlet port, there is always a tendency for neat air to enter first because, while valve is closed and mixture is not moving, fuel droplets deposit themselves on intake walls. This obviously upsets mixture strength, a variable amount depending on engine speed.

In practically all other respects, the Fox is a compromise between performance giving features and weight economy. To achieve adequate strength with the least amount of metal, the entire engine, with exception of working parts, jet assembly, cylinder head and end cover, is pressure diecast in aluminum alloy with a cast-in crankshaft bearing bush. For rigidity, heat dissipation and trouble free simplicity, this arrangement is hard to beat and might well be studied by full size designers.

The cylinder is fitted with a drop-in floating liner whose ports line up with gas passages cast in the block. It is retained by the cylinder head with a self-bonding gasket between the joint. This gasket, incidentally, should always be renewed when an engine is reassembled. The head is retained by six Phillips head screws on a good rugged flange which no amount of overtightening will distort. The drop-in type liner is superior to the shrunk type if properly fitted because it is less prone to heat distortion and is easily removed for replacement. Unlike most high performance engines, where piston is relieved on the skirt to minimize drag, the Fox features an almost fully lapped piston and has the bore relieved from the port belt downwards. There is very little to choose between the two methods on the score of piston alignment and slap as the amount of extra clearance is only about two ten thousands of an inch.

The bypass and exhaust ports are of the large cross sectional area usually associated with racing engines but are not so high, with the result that the effective stroke is longer, which makes for higher torque at low rpm. The Fox therefore breathes well with consequent high maximum output without unduly handicapping its pulling power when loaded down *to* slow speeds.

The piston is of conventional design for an opposed port engine but in common with the wrist pin, has been kept as light as possible consistent with adequate strength. The piston baffle is slightly higher than usual for an engine of this size and contributes in no small measure to ease of starting and high volumetric efficiency, because it ensures that as little mixture as possible escapes through exhaust port during bypass phase. An old rule of thumb for two-cycle design is that baffle should be at least as high as bypass port. In the Fox, it is slightly higher than the exhaust with proportionately greater efficiency, though probably any further increase would begin to have an opposite effect because of pocketing in combustion chamber with a straight fence baffle.

Crankshaft is one of the heaviest ever seen on a .29, being 7/16" diameter, with a 5/16" diameter gas passage and a square rotary valve port. Conversely, however, the crankpin is rather on the small side, being only 3/16" diameter, whereas experience has shown that a 1/4" diameter pin is none too large for this size of engine. The large shaft is of course excellent as it provides great rigidity, a low bearing load per unit area, and allows a highly efficient gas passage. As to the crankpin, one considers that this bearing is just as heavily loaded as the main bearing and also works under less favorable conditions of lubrication and variable rotational loading in relation to the rod. A little more metal than is absolutely necessary for adequate strength could be left around the small diameter rod bearing. Actually, there is enough clearance in the crankcase to accommodate a larger bearing; the explanation that comes to mind for not using it is that a small diameter may have lower frictional losses when lightly loaded. However, there were no signs of rod bearing wear in these tests which usually show up any weaknesses an engine may have.

The minor details that are thoughtful and noteworthy on the Fox include a spraybar design which is unusual in that overtightening the needle merely tends to tighten the spraybar retaining nut instead of loosening it, as on most engines. Also, the needle is formed in such a way that, although situated close to the prop, it can be easily adjusted without danger to knuckles. The mounting lugs are strong and unlikely to get damaged in a crash, and lugs provided for retaining the backplate are substantial enough for use as radial mounts if necessary. The prop driving disc is made of steel and is strong and foolproof, fitting onto a substantial and positive taper. The prop is retained by the good old-fashioned and practical 1/4" nut.

Starting from cold is improved by priming the bypass through exhaust ports with a few drops of fuel. Hot starting is easily accomplished by choking intake for one flip.

Needle control is smooth and positive with a running tolerance on nitrated fuels of about four turns. The .35 is if anything slightly easier to handle than the .29, though both engines are extremely manageable.

In conclusion, it is evident from performance figures that the extra displacement of the .35 shows to most advantage at lower speeds; on engines tested, output was almost the same at peak power. The .35 will therefore accommodate really tight aerobatics more easily.

It is necessary to stress particularly in the case of these light weight stunt engines that, owing to there not being much mass to absorb vibration produced, it is vitally important to use really solid mounts.

Plug—Ohlsson Std. long reach, as supplied (1-1/2 volts to start); Fuel—Supersonic 1000;

Running time prior to test—seven hours per engine (NOTE: Makers guarantee full power as purchased.); Bore (.29)—.738"; (.35)—.800"; Stroke (Both)—.700; Weight —5-3/4 ozs. approx.

Power Prop	*RPM (.29)*	*RPM (.35)*
10x8	11,500	11,900
10x6	12,400	12,750
9x8	12,600	13,050
9x6	13,700	14,100
8x8	14,050	14,500
8x6	14,800	15,250
7x10-1/2	13,900	14,500
7x9	14,650	15,100
7x8	15,000	15,500
Top Flite	*RPM (.29)*	*RPM (.35)*
10x8	10,400	10,850
10x6	11,500	11,900
9x8	11,650	12,200
9x6	12,700	13,150
8x8	13,100	13,600
8x6	13,900	14,300

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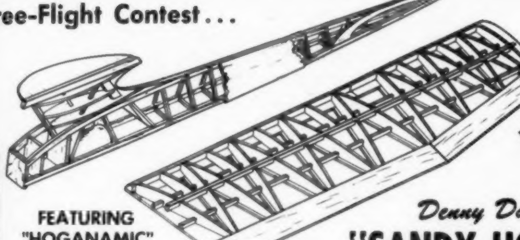

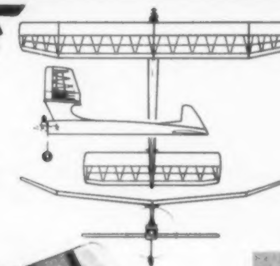

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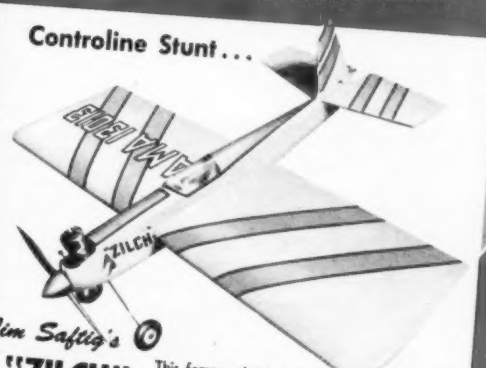

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